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Geological Exploration Work in Russia,
By D. I. Mushketov
Director of the Russian Geological Survey

Crushing Plant Flow Sheets and a System of Descriptive Symbols,
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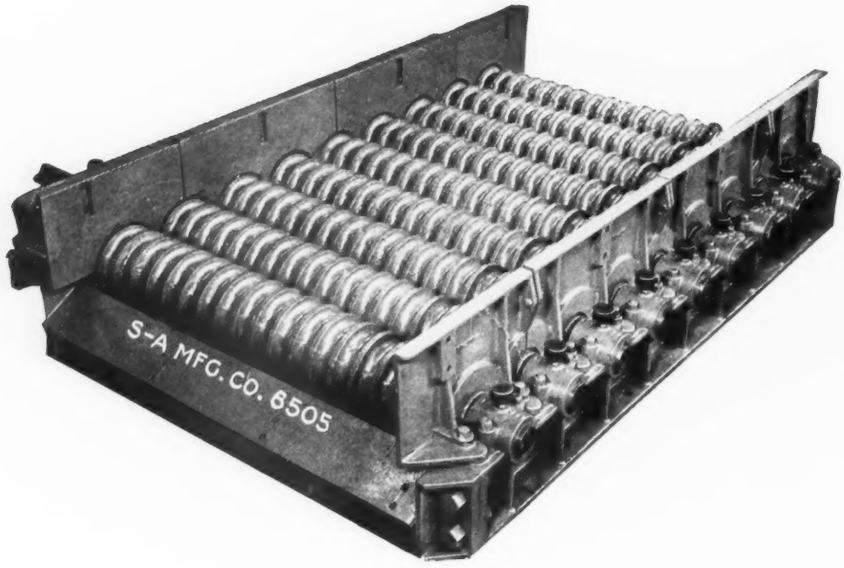
Modern Diamond Drill Equipment and Manipulation,
By A. W. Winters

Some Geological Features of Washington Magnesite Deposits,
By S. S. Siegfus

The Lumps Ride the Rims
The Fines Drop Through



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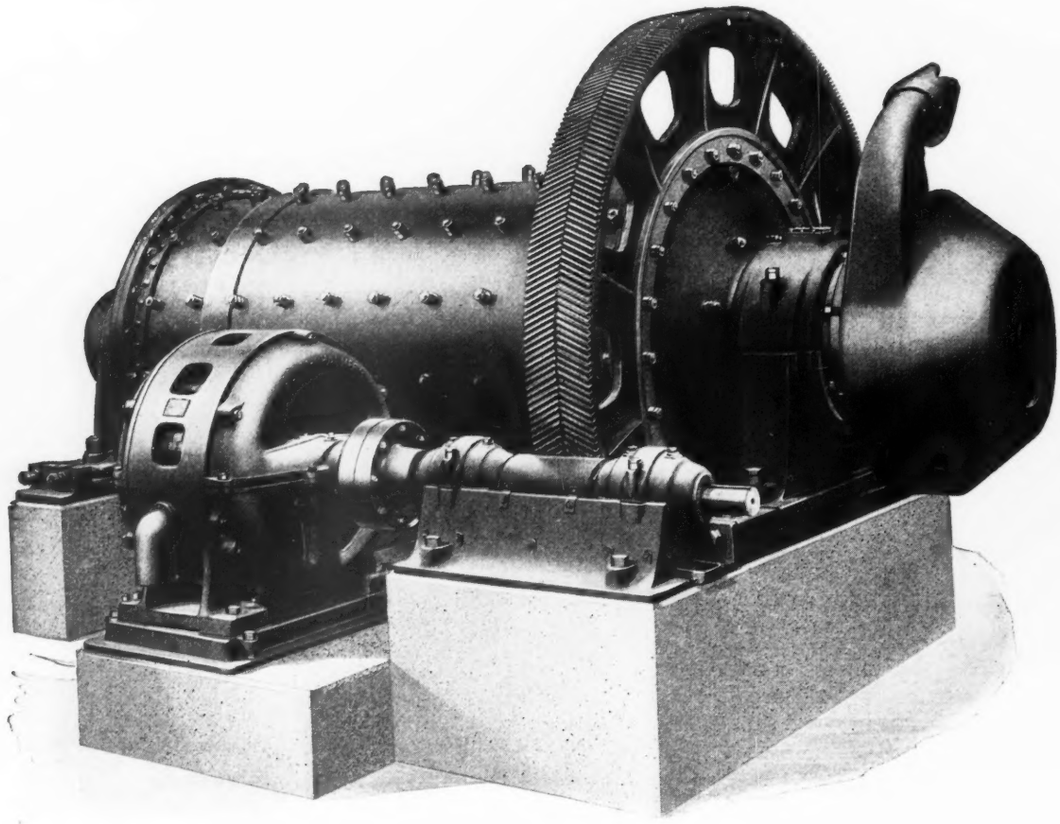

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ENGINEERING AND
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JAMES H. MCGRAW, *President*

A. W. ALLEN,
Editor

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Scrap the Obsolete, or Fail

THE GRIM DETERMINATION shown by some company directors to retain obsolete technical methods is pathetic. At a recent annual board meeting in London, the chairman averred that the company has spared neither effort nor expense during the past year to cheapen cost of production on its properties in South America and to bring both its plants into the highest state of efficiency. The efforts, on examination, prove to consist of making it possible to adhere to a primitive and wholly unsatisfactory process at an expense for repairs that amounted to nearly $150,000, or more than enough for an adequate program of scientific research, the remodeling of at least one of the plants to permit the application of improved methods, and the provision of the necessary up-to-date auxiliary equipment.

When disaster comes to such a company, as it is certain to come, everything but the real cause will be blamed. And yet the determination to abide forever by the technical conclusions of a former generation marks a certain sincerity that refuses to admit a possibility of error in judgment. As the relative of an inebriate explained to her sympathizing friends, "For years he was a martyr to delirium tremens," so many an operating company will have to quit the race because its director persisted in acting the rôle of "martyr" to the conviction that a process introduced fifty years ago must necessarily prove the best under all conditions, and that modern technical advance is too closely allied with experimentation to justify the sympathy and support sought from business and financial circles.

The Encouragement of Inventive Effort

CONSPICUOUS engineering achievement involves creative and inventive effort, despite the many current definitions of an engineer that infer, as his distinguishing characteristics, altruism and nobility of purpose in utilizing the forces of nature for the benefit of mankind. Without the urge to invent, the engineer becomes a cog in the wheel—indispensable, surely, but easily replaceable. Even as the appearance of one swallow does not necessarily indicate that summer has arrived, so one patent does not necessarily make an inventor. Yet there should be no greater spur to initiative, no greater incentive for deeper thought and more painstaking analysis, than the acquisition of a patent.

Although the involved phraseology adopted in many patents may scare the ordinary well-educated engineer into believing that nothing can be done unless a comparatively large sum is available for counsel in framing an application, the time is ripe for a word or two of advice that may serve to inculcate a little more confidence and to insist that the opportunity to seek United States protection of inventive rights is the heritage of the engineer of independent connections and moderate means. It is true that the United States Patent Office advises intending applicants to employ a competent patent attorney, wisely adding, however, that the Office cannot aid in the selection of such a person. This advice applies with force to the large majority of individuals, including cranks, who apply for patents, few of whom are engineers in any sense of the word. The attitude of the Patent Office in this respect is easily understood: many inventors find considerable difficulty in putting their ideas or thoughts into words. A graduate engineer is a literate person; he should be capable of describing his invention and formulating his claims, and it would seem desirable that he should have studied the art of seeking patent protection for his ideas, and the rules of practice in vogue in the United States Patent Office, before completing his education. The university that includes a short course on this subject in its engineering curriculum will have taken a significant step forward for the encouragement of initiative and the advancement of the individual engineer.

Legal phraseology is unnecessary in a patent application, despite the current opinion that skill in preparation may be gaged in terms of complication of description. Unmistakable clarity, so rare in a legal document, is the primary requisite to insure prompt and sympathetic consideration. The argument that claims must be multiplied to an extent inferring a lack of intelligence on the part of the examiner is provocative of endless argument with the Office, all of which consumes time and impedes the efficient functioning of this important government department. The educated engineer should be in a position to describe his contribution to the art and to formulate his claims in but a small fraction of the time needed to explain to and educate another in the intricate technique of his work and invention. If he cannot do this, it is obvious that our educational system is at fault. As soon as the fact is recognized that the government has in operation a protective machine for the benefit of the engineer; and that the engineer is not obliged, assuming that he is a literate person, to employ anyone to act for him whose service fees may be beyond his means—in summary, when the opportunities available in return for a modest expenditure in time and money are recognized—a stimulation of creative thought may be expected among many who now consider that application for patent is the prerogative only of those possessing ample means and influential connections.

It is not to be inferred that all the obstacles involved

in overcoming objections, clarifying claims, citing precedence and authority, and ultimately obtaining a patent for a complicated process or intricate apparatus can be overcome without expert assistance. It is believed, however, that there is scope for individual initiative among engineers in the drafting of the initial application, the outcome of which will usually serve to indicate if amendment or enlargement of claims is suggested and whether abandonment or a larger expenditure is justified.

Engineers should make use of the U. S. Patent Office; its files constitute one of the largest libraries in the world and are available to the inventor or would-be inventor at an extremely modest sum per specification. It is obligatory on the engineering profession, however, to adopt every means possible to insist that the department be adequately staffed and that the officials be remunerated in keeping with high moral responsibility and specialized knowledge, in support of and in continuation of the efforts sponsored by Mr. E. J. Prindle, who, as chairman of the Patents Committee of American Engineering Council, was largely responsible for the passage of the Lampert Patent Bill in 1922. To those that may perchance be unsympathetic to this plea, one can merely hint the appalling consequences to technical and engineering advance in this country that would follow a suspicion of irregularity in the functioning of this important branch of the Department of Commerce, now happily held in high regard throughout the world.

Russian Technicians Visit the United States

MORE Russian engineers and scientists have visited the United States in the last three months than in the previous two years. The purpose of these visits is threefold: to purchase industrial equipment; to study the methods and organizations of American industries and government bureaus; and to promote a better understanding between the technical men of the two countries.

Recent events in Russia encourage the belief that a definite and favorable trend in that country will, in time, make possible a more desirable official relationship between Russia and the United States than exists at present, to facilitate, incidentally, the investment of American capital and the development of American foreign trade. Without an official understanding more satisfactory than exists today, however, the achievement of much that would be of mutual benefit to both countries is impossible.

A biographical sketch of the Director of the Russian Geological Survey, an outstanding geologist of the country, a review of his recent visit to the United States, and a descriptive article of his concerning the work and organization of the Survey appear elsewhere in this issue. *Engineering and Mining Journal* is glad to pay tribute to Professor Mushketov's achievements, and hopes that the dissemination of such information may aid in the establishment of a better understanding between the technical men and the officials of the two countries.

That much might be gained by such an understanding is seen in the fact that a growing interest in American methods and products prevails in Russia. Imports from the United States are increasing rapidly, and it is estimated that the value of Russia's 1928 purchases of industrial equipment will be twice that of the preceding year.

Workmen's Compensation and "Weeding"

LEGISLATORS responsible for the enactment of state workmen's compensation or employers' liability laws must have realized that, in actual operation, such statutes may create conditions that are discriminatory against individuals who by misfortune or accident become "bad risks," but their zeal in behalf of such popular measures has not been influenced thereby. Frequently, an injustice accompanies the "weeding out" that follows drastic and over-liberal decisions by courts or local boards, as a correspondent has pointed out in this issue. Discharges to avoid responsibility have become so numerous in some states as to create a condition demanding serious consideration, particularly on the part of the engineer-executive. Requirement of a rigid physical examination before employment is certain to involve hardship to those rejected as below the standard, but the practice has spread notably in recent years, and is in the long run of benefit to the great majority of workers engaged in any industry or business. Some trade unions require a physician's certificate attesting the applicant's health before even an apprentice may be registered. An industrial army, in common with a military force, must be physically sound if it is to function even at reasonable efficiency.

Obviously, any program having for its objective the modification of existing workmen's compensation laws offers few attractions to the practical politician, whose business it is to secure, not repel, the votes of his constituents; and industry must learn how to "carry on" despite the handicaps of employers' liability statutes and burdensome taxes. The tendency will be to tighten the enforcement of laws enacted to protect the worker; and those who find compensation insurance charges exorbitant may extract some consolation from the knowledge that their tax assessment to maintain institutions and attendants, if those unable to [illegible]k became public charges, might equal or exceed t[illegible]mium paid for insurance.

In this law-making if not law-abiding land, few statutes are repealed, and only a few die by the innocuous-desuetude process. Common-sense, therefore, counsels prompt adjustment or readjustment to employers' liability legislation. Attempts to evade or to minimize legal responsibility create the ill will of the working force and sometimes of the community.

Fine records in the reduction of the accident rate have been made recently by many of the large mining companies, and the success of co-operative efforts to promote the safety and well-being of their employees warrants the conclusion that the executives at smaller properties may find information of value in a study of the safety and health methods adopted. A co-operative and sympathetic attitude on the part of all elements comprising the mining industry that will result in the development of a better mutual understanding, of which evidence is increasingly apparent, holds promise of increased efficiency and greater prosperity for all concerned. As soon as the effects of such co-operation become definitely established and recognized, data will be available on which to base demands for a material reduction in premium rates on accident and health insurance. Education in safety-first methods will reduce the number of industrial accidents and hazards to health, and a decrease in the charges for insurance protection should follow.

An Example of Beneficent Government Regulation of Industry

THE Commissioner of Prohibition, on the advice of the Advisory Council comprising the leaders of the industrial alcohol industry, has limited the production of that commodity during 1928 to eighty-five million gallons, thereby insuring the maintenance of a fair price and substituting co-operation for intensive competition. The Commissioner grants permits for a definite production by each manufacturer; the output may be raised at any time he is convinced that a legitimate increased demand has arisen. Modification of the ruling in this respect may be made from time to time, the Commissioner in such event calling the Council together, or seeking advice from a member of the Council with an intimate knowledge of the industry concerned. The Commissioner, therefore, acts in a helpful manner, after consultation and evidently upon the advice of the leaders of the industry. Harmony prevails and everyone is satisfied, particularly the manufacturer, who secures a fair price for his product and deals with customers who have no complaint to make in regard to the amount paid. Incidentally, industrial alcohol is an essential war material. The co-ordination of the manufacturing units in this country aided by the co-operative action of the government has placed this industry in the forefront of those who are prepared for any national emergency and in a position to serve the country efficiently and economically at a moment's notice should the demand arise.

In this instance the regulatory action was necessary in order to prevent abuses under one law. Is it logical to assume that such benevolent intervention on the part of the government is to be denied to any other industry in urgent need of economic adjustment? Is there no lesson to be learned from this example of industrial-governmental co-operative action in regulating output, a lesson that may be taken to heart by other industries in far greater need of sympathetic consideration because of the action of destructive internal competition and, perhaps, an overproduction that cannot be absorbed under a condition that cramps opportunities for a more intensive sales campaign?

The Promise of Synthetic Rubber

GERMANY, so we are told, has at last solved the problem of synthetic rubber. The news, according to the daily press, was taken immediately to the New York rubber trade, the members of which expressed skepticism, maintaining that a dozen times in the past decade similar reports had been circulated, but always the product has failed to equal Para rubber in quality, or the cost of production has proved too high. These comments indicate shallow thinking. Because satisfactory achievement—economic and technical—has not been recorded in the past, no sane person should be skeptical concerning what is being done in the present or can be done in the future. It is not improbable that a satisfactory substitute for natural rubber will be produced or has been produced. It is not improbable, moreover, that the cost of manufacture may permit successful competition against the natural product at its present market price. However, the rubber trade should have sought consolation in another direction: That the price of natural rubber, by mass production and still more scientific methods of cultivation, can be reduced to a point that will leave little scope for the marketing of a substitute. The fertility of tropical soil may yet win in a contest with the fertility of the brain of the synthetic chemist; although Germany may be willing to suffer economically rather than admit that commercial supremacy does not necessarily follow technical achievement in every field of endeavor.

The mining industries are fairly secure against the fear of advances in the science and art of synthesis. Metals are elements, and therefore incapable of synthesis; but some metallic compounds that are mined are threatened. As with rubber, however, considerable leeway is usually possible by lowering of costs of production, a leeway that is far less obvious in the synthetic industries. The price of nitrate to the ultimate consumer, for instance, can be cheapened by more efficient mining methods; by the simplification of recovery treatment; by a higher technical extraction and a lower loss in residue; by economies in fuel consumption; by reduction in cost of delivery to the consumer; by industrial co-operation between employer and employee, aided, not hampered, by the government; and by a shading or the abolition of a heavy export tax. The natural-product industry will experience periodical slumps, but an equal number of recoveries will be recorded as and when it is recognized that costs can be reduced.

Important Decision by the Mexican Supreme Court

A LONG STEP FORWARD in the development of amicable relations between the United States and Mexico was achieved last week, with the decision of the Mexican Supreme Court that the provisions of the new petroleum law, with respect to the ownership of claims held prior to 1917, as applied to the Mexican Petroleum Company in the case under review, were unconstitutional. It will be remembered that Article 27 of the Mexican constitution provides that natural resources shall belong to the state. Article 14 of the petroleum law sought to carry out this idea by substituting fifty-year concessions for ownership of all oil lands, even those held before the constitution was adopted, and Article 15 provided for the forfeiture of lands for which concessions had not been applied within one year. Such action was naturally objected to with great zeal by many of the petroleum companies, and the Mexican-baiting press of the United States seized the occasion as exemplification of their freely published belief that Mexican legal proceedings were merely legalized banditry and that there was no justice south of the Rio Grande. The current decision, which is reported to be thoroughly satisfactory to the oil companies, indicates that in Mexico, as in the United States, the Supreme Court stands as a bar to ill-considered legislation.

Whether or not the speed with which this decision was made can be attributed in any way to the favorable reception accorded to the new United States Ambassador, Mr. Morrow, and to his good offices, does not greatly matter. It is evident that a good start has been made in smoothing out the difficulties that in recent years have developed between the two nations, a progress which it is hoped will not be adversely affected by the current rabidities of the yellow press.

Professor D. I. Mushketov

DIRECTOR OF THE
RUSSIAN GEOLOGICAL SURVEY

A Biographical Sketch

BASED ON AN INTERVIEW
BY H. D. KEISER

WHEN I asked Professor D. I. Mushketov to tell me something of his life, he chuckled and surprised me with the brief reply, "It has been spent at the St. Petersburg Mining Institute." Evidently he had been asked the same, or a similar, question many times in the course of the last two months while traveling from Coast to Coast, visiting the principal cities, and addressing numerous scientific bodies and institutions of learning. Only a person with the splendid physique of Professor Mushketov—he is more than six feet tall and well proportioned—could complete such a strenuous tour of the United States and at its conclusion radiate his cordiality and entertaining good humor.

EXPLAINING his brief statement, Professor Mushketov, a moment later, continued: "I was born at the Institute in 1882 and was educated there, graduating in 1907. Following my graduation, and until 1917, I served successively as instructor, assistant professor, and professor in the department of geology. From 1917 to 1926, I was president of the Institute." "Gorni Institut, Ekaterini II, to use the former Russian name of the institution," he added, "is 154 years old and is the second oldest mining school in the world, being exceeded in age by only the Freiburg institute in Germany. My maternal grandfather was induced to leave the faculty at Freiburg to join the staff of the St. Petersburg Institute. My father, an eminent geologist, also received his education at the St. Petersburg Institute, and subsequently served throughout the full course of his professional life as a professor in the Institute's department of geology." Professor Mushketov's first statement, therefore, was literally true—he had spent his life at the Institute.

IN 1926 Professor Mushketov became Director of the Russian Geological Survey, with which branch of the government he had served as geologist during his professorship. In 1923 he founded the Institute of Practical Geophysics. This organization, of which he is director, has made a thorough study of the geophysical methods of prospecting and has contributed considerable valuable information relative to these methods.

Most of Professor Mushketov's field work has been recorded in the publications of the Comité Geologique and Geographicheskoe Obshestvo (the Geological Survey and the Geological Society of Russia). His principal contributions include studies of the gold deposits in the Lena district of Siberia, of the coal deposits in the Far East along the Pacific Coast, and of the Donetsky coal basin in southwest Russia. Since 1909 he has spent most of his field periods in central Asia and Turkestan. He surveyed and prospected the Fargana district in southeast Russia to the northern border of Pamir. In northern Pamir he studied the now well-known overthrust formation there, which he discovered last summer.

PROFESSOR D. I. MUSHKETOV

THE primary purpose of the Professor's visit to the United States was to study the organization of the national and state geological surveys. The work of these agencies in Russia, he stated, was similar to that of the government technical departments here, especially in that it covered large areas. A study of the organization of these branches of the government of this country, he added, would be valuable in formulating the reorganization plans for the geological surveys of Russia. On his return to Russia he plans to extend the work of the state geological surveys; increase the amount of prospecting done, particularly geophysical prospecting; and arrange for a more extensive interchange of professional information between Russian geologists and those of other countries.

During his visit Professor Mushketov has spoken before the meeting of the Association of State Geologists, at Urbana, Ill., on "The Geology of Central Asia" and "The Organization of the State Geological Surveys of Russia"; before the Geological Society of Washington, D. C., on "Structural Geology of Turkestan"; and before the Academy of Science of New York, on "General Geology of Central Asia." He also addressed the students and the faculty of the departments of geology at Chicago University, Princeton University, and Columbia University.

On Nov. 16 the Professor sailed on the "Aquitania" for Europe. He will lecture at the University of Glasgow and at the leading universities in Holland and Germany.

GIVING liberally of his broad knowledge, and extending the greatest courtesy and cordiality to all those with whom he came in contact, Professor D. I. Mushketov has, in his brief visit here, done much to promote mutual understanding between the mining men of the two countries, and to strengthen the belief in the vast potentialities of Russia.

*Geological Exploration Work in Russia**

By Professor D. I. MUSHKETOV
Director of the Russian Geological Survey

DURING the World War all the countries involved were faced with the necessity of meeting as rapidly as possible the changed and enlarged demand for various kinds of raw material. At the same time, the altogether unique conditions at the front and in the rear of the enormous armies, and the new and more scientific methods of warfare, called forth entirely new problems in the application of geology to war needs. In connection with all these problems, and upon the termination of the war, with the consequent necessity of industrial reconstruction in the various countries, the largest government geological organizations in Europe were compelled to widen greatly the scope of their work and to modify its character, and accordingly to change their organization. The degree and nature of this change in the geological organizations differs for the various countries, and in a number of cases these alterations in the original character of the geological organizations called forth serious discussions in scientific, industrial, and government spheres. Scientists frequently objected to the excessive utilitarian development of the activities of geological institutions. Industry and government argued in favor of making as much concrete use of scientific exploration work as possible. At the same time, a recognition of the importance of the geological service in the general machinery of economic administration in the various countries was steadily gaining ground. A lively exchange of opinion on this question found expression recently in the United States. In this connection the opinion of the leading authorities on mining engineering is aptly summarized in the statement of the former president of the American Institute of Mining and Metallurgical Engineers, Dr. A. S. Dwight, to the effect that the geologist should now exchange the rôle of historian of phenomena already disclosed for that of prophet and director of industries. This inevitable process of change of functions and organization of the government geological institutions has been taking place in Russia since 1915.

The Geological Committee during the first 35 years of its existence—it was founded in 1882—was engaged exclusively in geological surveying and in purely scientific work; toward the end of the war it was compelled to devote almost entire attention to applied geological work. The cessation of the war, followed by the revolution and changes in the political and economic structure of the country, still further increased the inevitability of the change; or, to be more exact, the widening of the sphere of activity of the Geological Committee, or Survey.

During the first years of the last decade, until the termination of the civil war in 1920, the activity of the Geological Survey naturally could not have been intensive or productive, owing to difficult living conditions, the presence of numerous fronts in the country during the period of civil war, and to the blockage that isolated Russian geologists from all contact with foreign geologists, and made it impossible for Soviet Russia to receive geological literature or apparatus from abroad.

Beginning with 1920, with the gradual improvement in the conditions of work, the Geological Survey commenced to develop rapidly; and, meeting the necessity for exploration of new deposits and taking an inventory of all available mineral resources of the country, the organization was changed accordingly in the last few years. In addition to continuing its former fundamental work of geological surveying throughout the country,[1] the Geological Committee has a special branch engaged in prospecting. To illustrate the progress made in this direction I cite the following figures: In 1924 the number of prospecting parties amounted to 93, in 1926 it reached 136, and in 1927 it exceeded 200. In 1924 the total drillings aggregated 3,500 ft.; in 1926 this total rose to 54,000 ft. (not including the holes and wells drilled by the various mining trusts.) In the search for new deposits, the main purpose is to find new sources of copper, polymetallic ores, oil, and non-metallic substances formerly imported, so as to insure a domestic supply—namely, potash (in 1926, in the Solikamask district—West Ural—on an area of 4 square miles, a supply of 68,000,000 metric tons of K_2O has been found, which constitutes only a part of the supposed total deposits); bauxite (aluminum ore), asbestos, sulphur, and mica, large deposits of which were found on the river Mama in Eastern Siberia. In the last three years the Geological Committee, as well as the Institute of Applied Geophysics, that I organized, have developed the application of geophysical methods in geological prospecting—magnetometric, gravimetric, seismometric, electrometric and radiometric, including those used in Sweden, in the United States, and in Germany, as well as those originally devised by means of apparatus of our own construction. Some of the results obtained have been made public in the *Bulletin* of the Institute of Applied Geophysics.

For the purpose of keeping track of the mineral resources, a third economic and statistical branch of the

*This article by the Director of the Geological Committee of the Union of Soviet Socialistic Republics deals only with the work of that committee, without touching upon the work of a number of other scientific geological institutions.

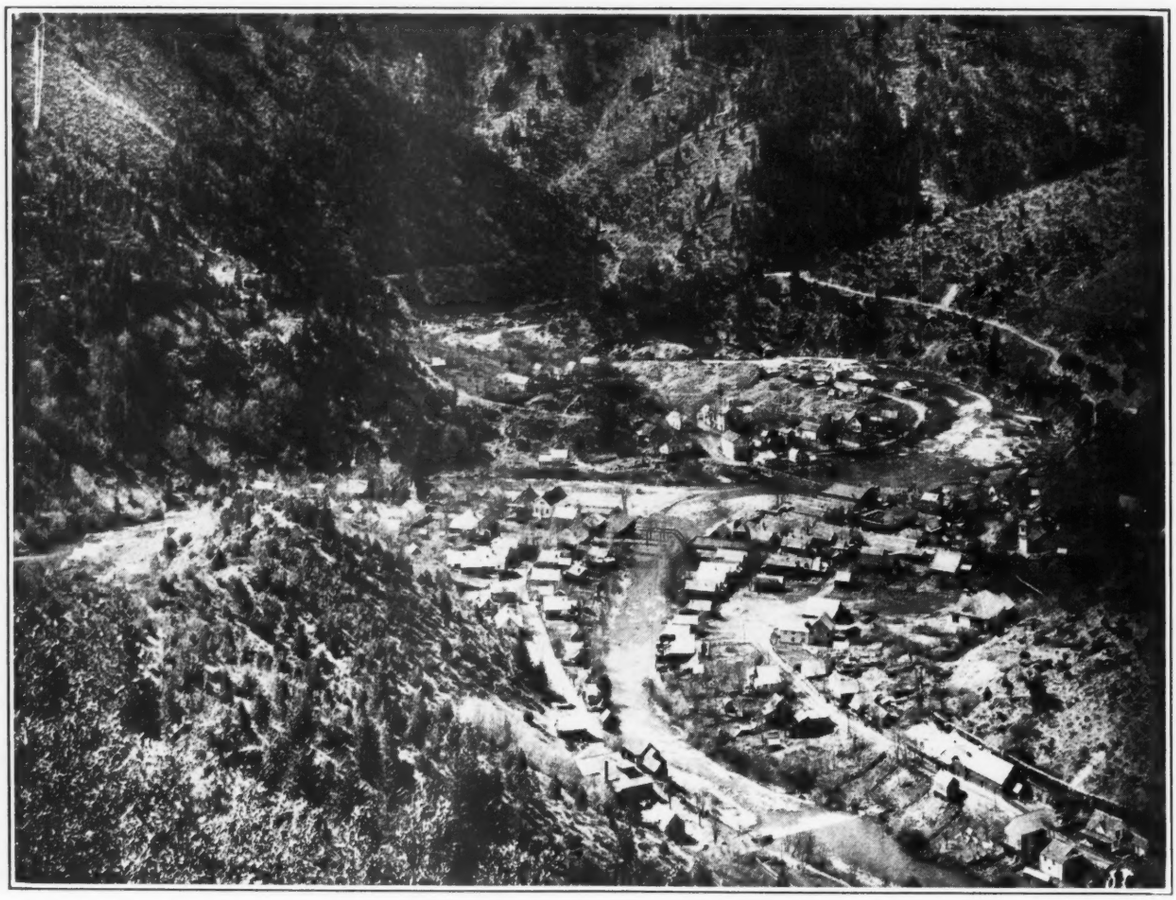
[1]So far, only 30 per cent of the general geological map of European Russia has been completed, and at the present rate at which the work is proceeding it may be finished altogether within fifteen years. As regards the Asiatic territory of the U.S.S.R., the work is naturally proceeding at a slower pace. Considering the vastness of the territory of the U.S.S.R., which occupies one-sixth of the earth's surface, the geological surveying has to be confined to the most populated and most important industrial regions, chiefly along the railroad lines and the waterways.

Geological Committee was organized, whose work is analogous to that conducted by the Conservation Branch of the U. S. Geological Survey. Finally, a branch was organized for the rapid determination of collections of specimens brought by specialists, for the creation of a museum of regional and applied geology, and for solving the various other problems of a purely theoretical nature.

Increase in Appropriations and Personnel

The development of the activity of the Geological Committee leads also to the necessity of decentralization, for the purpose of effecting the greatest possible economy and in order to satisfy local needs. For this purpose, eight main branches of the Central Geological Committee in Leningrad have been organized in the following cities: Moscow, Kiev, Ural, Rostov, Tomsk, Irkutsk, Vladivostok, Tashkent, with subdivisions in Kharkov, Iakutsk, Verkhneudinsk, Kizyl-Orda, Pishpek, Samarkand, Ashhabad, Piatigorsk, and Tiflis. This ramification is bound to increase. The total budget of the Geological Committee rose from $480,000 in 1913 to $3,200,000 in 1926, or more than sixfold. The staff of permanent employees increased in the same proportion, from 153 to 964. In this connection it should be borne in mind that the work is being carried on at small expense, as the average expenditure per geological surveying party amounts to only $3,000 per year, which includes the salaries of the geologists. The average yearly expense per prospecting party amounts to about $6,000. Considering the vast expanse of the territory and the tasks the Geological Survey is called upon to undertake, the budget figures mentioned are by no means sufficient and will continue to grow. The economic development of even an agricultural country is impossible without a sound knowledge of its natural resources.

Downieville, in the Heart of the Sierra County, California, Gold Belt



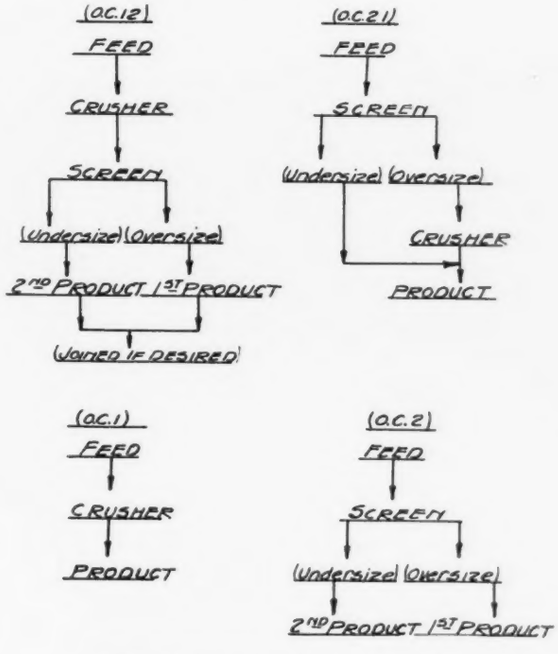
DOWNIEVILLE is a California mining center in the Sierra Nevada, at the junction of the North and South Forks of the North Yuba River. In 1849 Philo A. Haven, Carlos Haven, Warren Goodall, and Thomas Angus located claims on Little Rich Bar half a mile below Downieville. The Yuba River and its neighboring benches were rich in placer gold in the vicinity of Downieville, which is one of the mining towns of a region which has possibilities for hydraulic and channel mining and in which lode mining is still important.

Crushing Plant Flow Sheets and a System of Descriptive Symbols

By C. W. TANDY
Garfield, Utah

THE mechanical equipment of a crushing plant may be divided into three classes: the crushing machinery, the sizing appliances and the transporting system. These component classes of equipment can be operated in open circuit or in closed circuit.

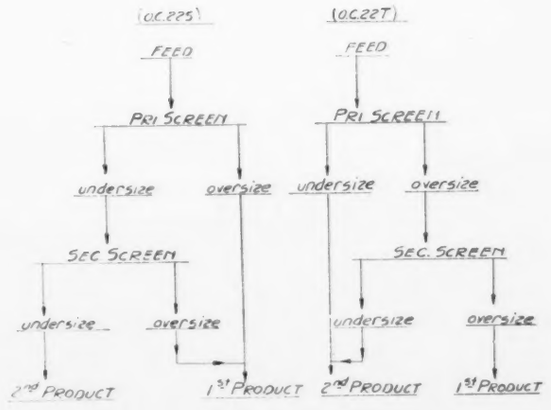
It is customary in crushing-plant design, in order to obtain the maximum capacity and economy of operation, to have the various units of equipment balanced in capacity. If a unit is continuously overloaded, and the



Simplest types of open circuit

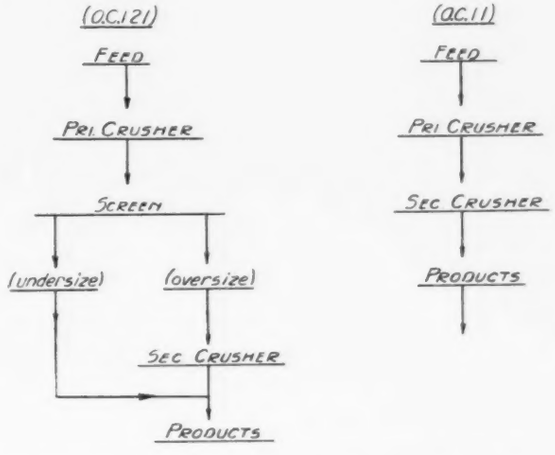
remaining units have ample capacity, the overloaded unit should be replaced by one of larger capacity (equivalent units in parallel may be added) or a second unit, not necessarily of the same class, should be placed in series with the first. For example, a gyratory crusher may be supplanted by one of larger capacity; a screen may be duplicated; or a conveyor may be relieved by screening out fines from its feed, thereby avoiding what is sometimes called giving the ore a "free ride." Again, a roll may be relieved from excessive duty by providing another roll to follow it.

Flow sheets of open and closed circuits, consisting of one crusher and one screen with one secondary crusher

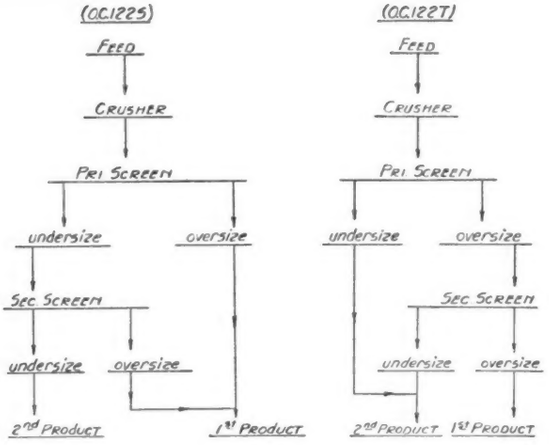


Open circuit with secondary screens. Left, screens in series; right, screens in tandem

and one secondary screen, are presented herewith. For the sake of simplicity the transporting equipment has been omitted from the diagrams. Flow sheets involving four or more sets of equipment in open circuits and five or more sets of equipment in closed circuits will not be considered. They are uncommon and in analysis can be shown to be combinations of one-, two-, and three-part open circuits and two-, three-, and four-part closed circuits.

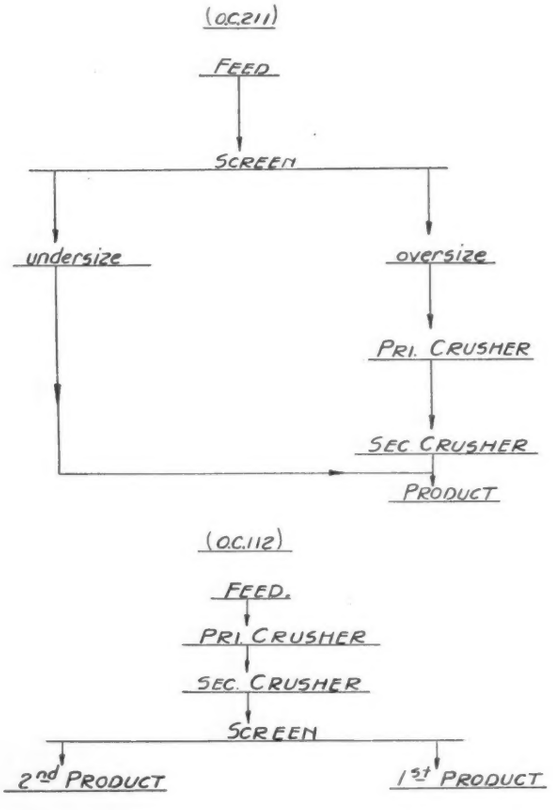


Open circuits. Left, screen between primary and secondary crusher; right, primary crusher followed by secondary crusher; no screening

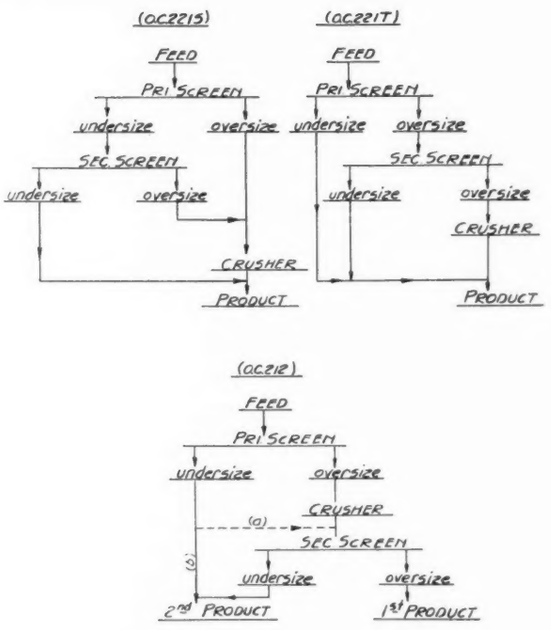


Open circuits. Crushers followed by screens. Left, screens in series; right, screens in tandem

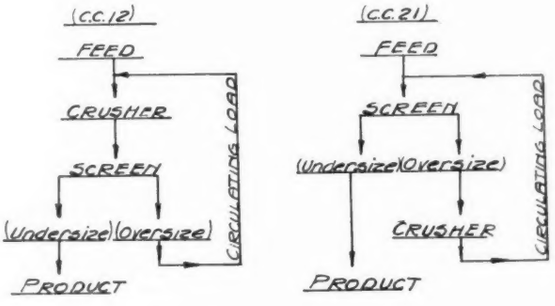
The numbering of the various flow sheets serves as a classification of type. The letters O.C. and C.C. represent, respectively, an open circuit and a closed circuit. The numerals 1 and 2 represent, respectively, a crusher and a screen. The letters S and T indicate the arrangement of a primary screen and a secondary screen when no crusher intervenes. The suffix S shows that the screens are in series—the fine product of the primary screen is the feed to the secondary screen; and the suffix T indicates that the screens are in tandem—the coarse product from the primary screen is the feed to the secondary screen.



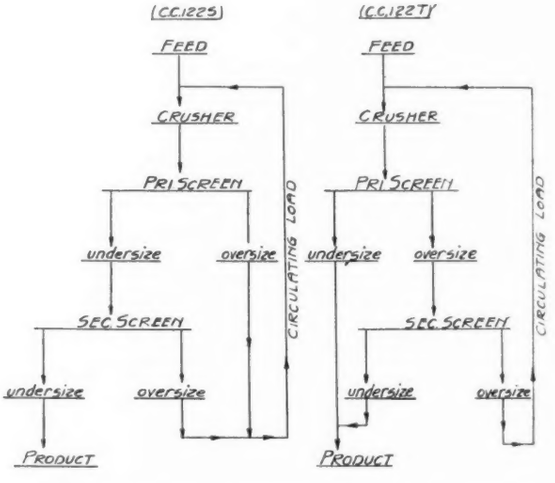
Open circuits. Top, screen preceding crushers; bottom, screen following crushers



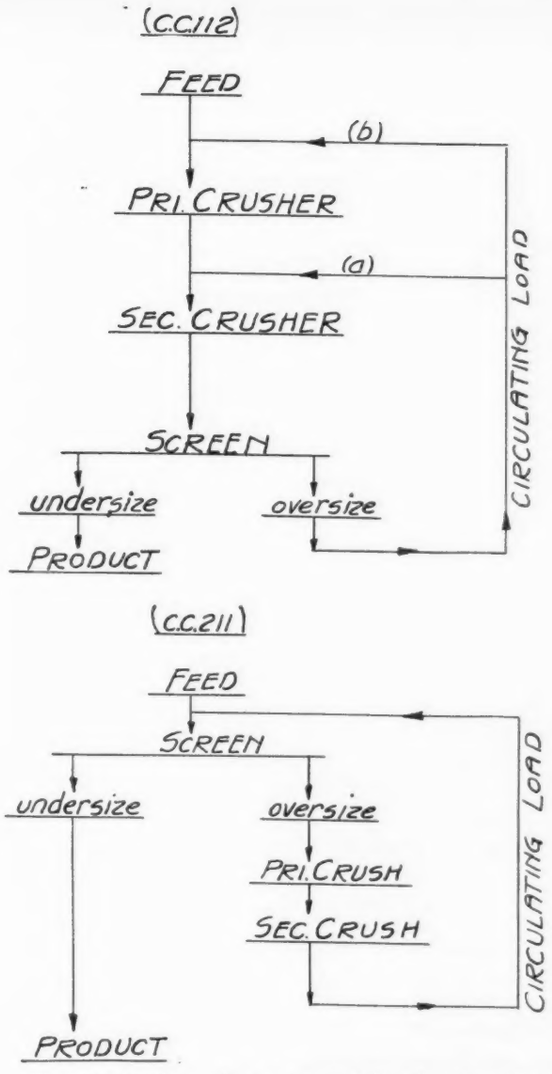
Open circuits. Screens preceding crushers. Top left, screens in series; top right, screens in tandem. Below, crusher between primary screen and secondary screen



Closed circuits—simplest types

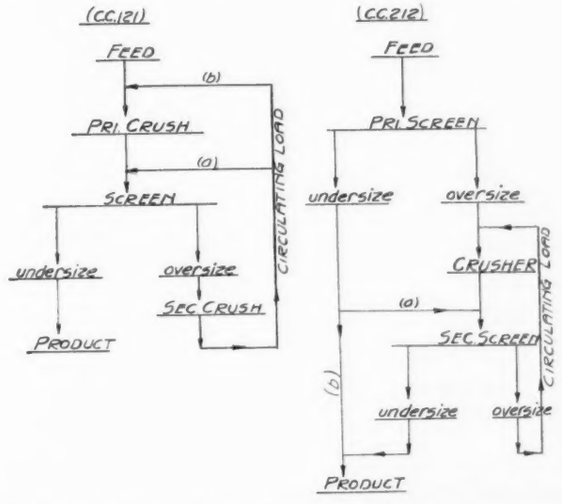


Closed circuits. Crusher followed by screens. Left, screens in series; right, screens in tandem

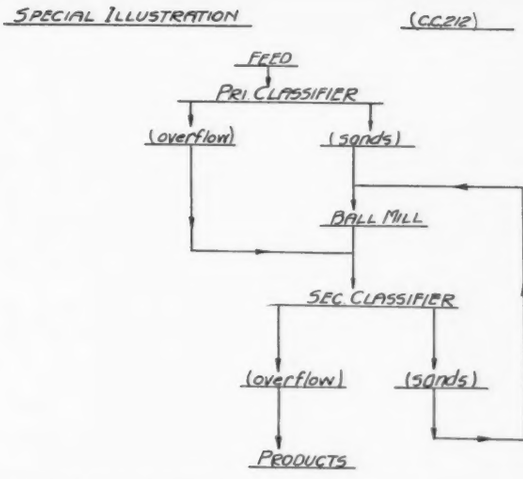


Closed circuits. Top, screen following crushers; bottom, screen preceding crushers

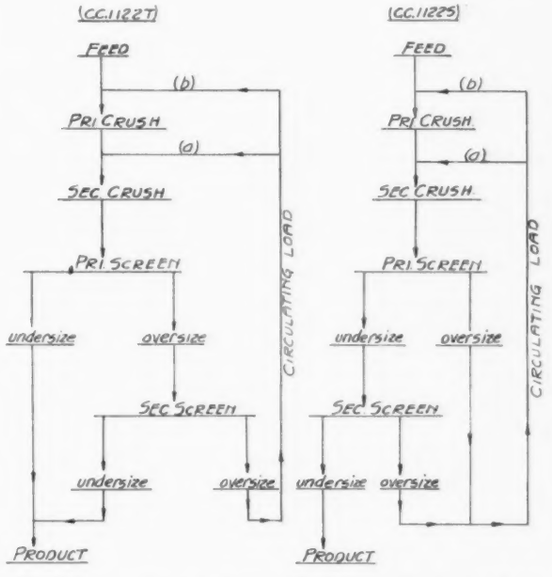
As an illustration, the symbols O.C.22IT indicate an open circuit with a pair of screens in tandem preceding



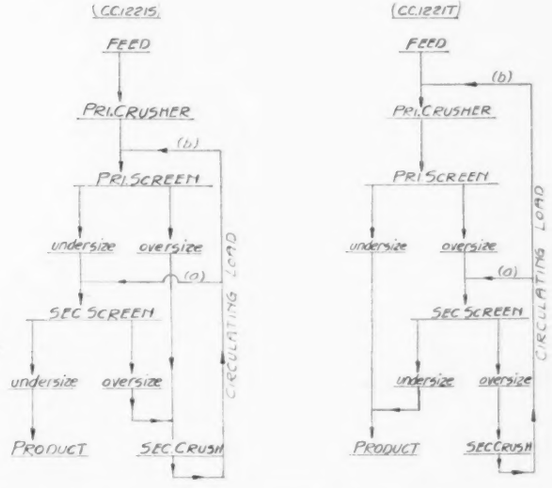
Closed circuits. Left, screen following primary crusher and preceding secondary crusher; right, one crusher only, preceded by primary screen and followed by secondary screen



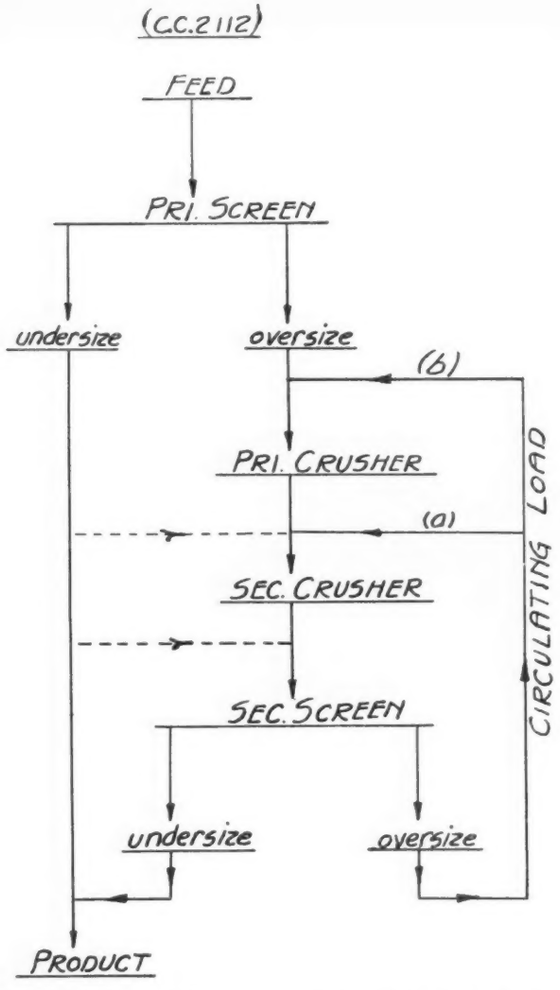
Closed circuit with primary and secondary classifiers



Closed circuits. Primary and secondary crushers in series followed by screens. Left, screens in tandem; right, screens in series



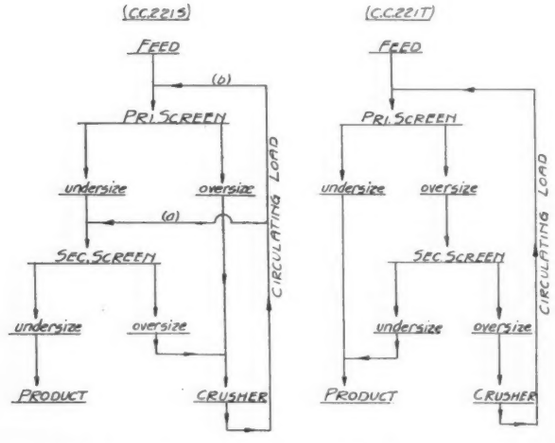
Closed circuits. Primary crusher—primary and secondary screens—secondary crusher. Left, screens in series; right, screens in tandem



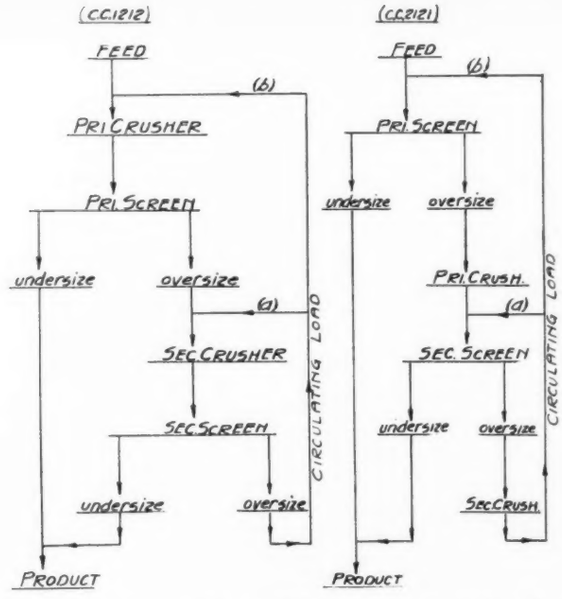
Closed circuit. Primary screen precedes both the primary and the secondary crushers. Secondary crusher followed by secondary screen

the crusher. If desired, a complete flow sheet may be symbolized. Thus:

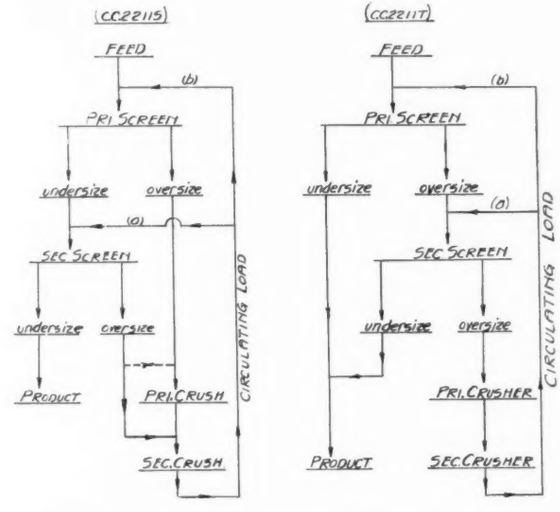
C.C. 2 x 2 1 — 1 S
↓ ∧ ∧
x P 2nd.



Closed circuit. Crusher preceded by primary screen and secondary screen. Left, screens in series; right, screens in tandem



Closed circuits. Left, primary crusher and primary screen followed by secondary crusher and secondary screen; right, primary screen and primary crusher followed by secondary screen and secondary crusher



Closed circuit. Primary screen followed by secondary screen, both preceding primary crusher, which is followed by secondary crusher. Left, screens in series; right, screens in tandem

The characters employed in this symbolized flow sheet are:

√ (check) represents delivery point of the circulating load.

x (cross) represents routing of the primary undersize and secondary undersize.

∧ (carat) represents routing of the primary oversize and secondary oversize.

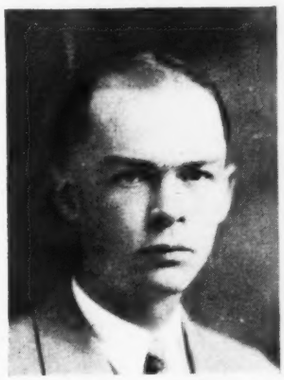
↓ (arrow) represents the finished product.

This, therefore, is a four-part closed circuit in which a pair of screens in series precedes the two crushers. The oversize of the primary screen is delivered to the primary crusher and the oversize of the secondary screen is delivered to the secondary crusher. The circulating load is returned to the secondary screen. The finished product is the secondary screen fine product.

Modern Diamond-Drill Equipment and Manipulation

By A. W. WINTERS

Mining Engineer, Marquette, Mich.



A. W. WINTERS

BLACK diamonds, or carbons, were first used for rock boring by Rudolph Leschot, a French engineer, in the construction of Mont Cenis tunnel in 1864. The diamonds were crimped in the face of an annular ring or bit and caused to rotate under pressure against the rock face, thereby cutting a hole suitable for charging with explosive. Leschot's drill holes were made for blasting with no intention of core recovery, and the significance of this aspect of the appliance was not realized. Although blast holes are no longer bored by diamond drilling, diamonds are still crimped into the face of an annular bit, which is caused to rotate under pressure into various rock formations. Leschot's principles of operation have changed little, although more than half a century of experience has enabled us to refine his methods and equipment so that today the diamond drill is an invaluable aid in nearly all stages of the exploration and development of a mining property, in the selection of bridge, dam, and foundation sites, in drainage and ventilation problems, oil-structure investigation, wildcat drilling, and similar problems.

Until about 1920 the steam-driven drill was the accepted standard in the field, and gasoline-powered equipment was looked upon as a rather doubtful experiment. This attitude on the part of drill operators was perhaps justified. Gasoline engines of the period were not satisfactorily adapted to the requirements of the service; they could not be controlled with such nicety as a steam-driven drill; they were, as a rule, noisy, and much of the drill-rod vibration was attributed to the pulsations of the motor. I worked with several small drill outfits, gasoline-engine driven, between 1916 and 1919, in which four-cylinder marine-type motors and Ford Model T motors were used with varying results. These motors had ample power to carry the drill hole to approximately 1,000 ft., recovering a core about an inch in diameter. The cost of operation was less than with a steam unit of the same capacity, and the rapidity with which the outfit could be moved and put into operation again gave assurance of its universal acceptance as an improved diamond drill. For deeper work, with recovery of core of larger diameter, a Stearns 60-hp. engine was used as power to drive a Longyear No. 3 drill equipped with hydraulic swivel head. The motor had already seen considerable service, having outlived the chassis of a touring car. Satisfactory results were obtained with this hook-up, and core was easily taken from a vertical depth of more than 1,200 ft. A Goulds' triplex pump furnished water for both drill hole and operation of the hydraulic swivel head.

It would be difficult to compare a gasoline-driven drill of 1920 with one of present date. Improvements have been exceedingly numerous. It is no longer necessary to depend on marine and automobile motors for power. The gasoline-engine manufacturer now supplies a highly developed industrial motor, designed and built for hard service in the field. The diamond-drill manufacturer has been quick to incorporate the diamond drill in the design of portable and stationary equipment. So equipped, the gasoline-powered diamond drill is gradually superseding, wherever practicable, its more cumbersome predecessor, the steam-driven outfit.

Probably the most recent development in the form of a portable unit is one using a Ricardo Head 4-cylinder motor, four-speed transmission, reciprocating pump, and a No. 2 drill machine with a No. 2N hydraulic swivel head. The motor is quiet, efficient, and economical. High-grade transmission, dry-plate multiple-disk clutch, flexible couplings, all make for a smoothly operating unit. Convenient and sufficient power ranges are obtained for the different operations of drilling, reaming, and rod pulling, through shifting of transmission gears, with the motor governed at 1,000 r.p.m. The pump has an independent drive, and its speed or pressure is not affected by a shift of transmission gears or disengagement of the clutch. High-grade ball bearings are used wherever feasible, and thorough lubrication has been provided. All drive gears are of course hardened and ground to insure long life and quiet operation. This type of portable drill is finding much favor in districts and on operations where moves are numerous, because of the great amount of dead time eliminated between actual drilling periods.

Compressed air is of course the logical source of power for underground drilling, being used in place of steam in connection with the standard steam engine drills. Electrically driven drills are not in great demand because operations are usually carried on at parts far removed from a source of power.

Complete diamond-drill outfits for either surface or underground stations, driven by hand, steam, gasoline, or electricity, may be obtained to recover core from depths of 300 ft. to about 6,000 ft. maximum.

In diamond drilling, when the work is done for the purpose of ascertaining the character and analysis of the rock and the computation of the volume of a given body of ground, the all-important object to be attained is the recovery of sufficient core and sludge, and the acquisition of accurate knowledge of its location in the hole. At times, however, core recovery is difficult and almost im-

possible, in which event the sludge recovery must serve as the only means of identification of strata. Failure to recover core may be caused by several conditions, among which are: dissolution of core by the drill wash water, and failure of ground to core on account of its soft or loosely knit structure. The first condition is sometimes remedied by using a solution for washing in which the ground being drilled is insoluble. The second condition is commonly remedied by the use of the double-tube core barrel. In this core barrel, the wash water is prevented, as far as possible, from coming in contact with the core as it rises in the core barrel. Further, the core is not subject to the agitation and abrasion of the rapidly rotating outer barrel. As the name implies, this barrel is composed of one outer and one inner tube, with the wash-water course in the circular space between tubes. In drilling, the inner tube does not rotate. High core recovery is invariably obtained with the improved type of double-tube core barrel.

Core Must Be Preserved in Chronological Succession

Notwithstanding the fact that core recovery is frequently an undertaking that taxes the skill of the drill runner and the engineering ability of the contractor, carelessness is too often evident in the handling and filing of recovered core. It is obvious, especially in oil-structure investigation, that too great care cannot be exercised in placing the core in the core boxes in its proper chronological succession—that is, in exactly the manner in which it lay in the drill hole. A misplaced piece of core, whether it be in oil-structure investigation or iron-ore formation drilling, is sometimes worse than no core at all, on account of the misinterpretation it may receive. In the matter of core filing and the interpretation of results it may be well to mention here that a core splitter is an almost indispensable accessory. With it, recovered core may be split longitudinally, one half analyzed, and the remaining half replaced in its original position in the file. Analysis of the core furnishes final and incontestable proof in the checking of drilled orebodies.

According to drill manufacturers the time is rapidly approaching when a great amount of work now being done by cable tool rigs and rotary rigs will be handled more economically and effectively by the diamond drill, which possesses a distinct advantage over the cable-tool rig. To complete a hole at great depth the cable-tool rig must begin with casing of large diameter and gradually come down, as conditions demand, to more moderate size. In many instances holes have been abandoned on account of the cable-tool rig "running out of hole." Incidentally, abandoned holes may be brought to successful completion by the diamond drill. In oil-field work the diamond drill may be operated much as a rotary drill, in that it may drill by the fishtail method, using a mud fluid to seal the wall of the drill hole. In hard rock, however, it will outdistance the rotary. With all due respect for the different makes and types of steel and alloy-drill bits, none as yet has been devised that will cut as effectively and rapidly as the Brazilian black diamond Selection of black diamonds is becoming more and more a task for the experienced, and inasmuch as it is economy to use only stones of the best quality, persons unfamiliar with them should procure the services of a reputable diamond selector.

The proper setting of the diamonds in the drill bit requires much skill and experience. A bit poorly set may be the cause of the loss or serious destruction of the entire set of stones, the total cost of which will in most cases be as great as or greater than the drill itself. However, with diligent practice and conscientious effort, a green man may in six months' time set enough bits per day to satisfy the requirements of one drill, working in ground of ordinary hardness. For practice, small irregular-shaped pebbles of ordinary hardness may be used instead of diamonds. The procedure of setting a bit is as follows: The blank bit is screwed into a setting block that is securely clamped in the bench vise. With a pair of dividers and a center punch the face of the bit is divided into as many divisions as there are stones to be set. A setting ring is provided with each diamond-setting outfit, and this ring is large enough to be slipped over the outside of the bit and indicate the proper cutting clearance for the diamonds. The outside and inside clearances are usually $\frac{1}{32}$ in., and approximately the same clearance is allowed for cutting at the face of the bit. It is important that each stone be set so that it will have the same amount of clearance as its neighbor. Each stone is studied as to its adaptability for outside or inside use, the larger stones usually being set with clearance on the outside wall of the bit. A breast drill is now used to drill a hole at one of the division points, slightly larger than the largest diameter of the stone. In the setter's kit of chisels and tools will be found various pointed chisels. With intelligent use of several of these, the breast drill hole can now be shaped so that the stone will lie in the cavity in the bit and its contour very nearly fit that of the cavity, and at the same time be about correctly placed as to outside, top, and inside clearance. Small pieces of copper may be used to fill points that have been too deeply cut. Copper forms an excellent cushion for the stone. The stone is now ready for the final operation, that of crimping. Starting with a radius of from $\frac{1}{4}$ to $\frac{1}{2}$ in. from the edge of the stone, the metal of the bit is pushed toward the stone, using a flat chisel and light hammer until the stone is securely crimped in the bit. The ring or "feel" of the hammer blow on the chisel is the only indication of the tightness of the stone.

Mining Practice Helped Solve Holland Tunnel Ventilation Problem

Ventilation, naturally, was one of the biggest problems of the engineers who designed the newly completed Holland vehicular tunnels under the Hudson River between New Jersey and Manhattan Island, through which 60,000 motor vehicles passed during the first 24 hours of operation on Nov. 13. Ten years ago the late Clifford M. Holland, then chief engineer for the project, was looking for the best obtainable advice and information on the subject of underground ventilation. Engineers advised him that officials of the Anaconda Copper Mining Company had given the question more study and accomplished more in the practical application of ventilating practice than any one else in the world. Mr. Holland went to B. B. Thayer, for whom he had worked at one time, and through him arranged that tentative plans and proposals for the ventilation of the sub-river tubes be sent to Butte. W. B. Daly, who is now manager of mines in Montana, and various members of the Anaconda staff made many suggestions and recommendations that were incorporated in the final design. Technical knowledge based on experience is one of the important products or byproducts of the "richest hill on earth."

Some Geological Features of the Washington Magnesite Deposits

By S. S. SIEGFUS
Geologist, Bakersfield, Calif.

S. S. SIEGFUS

THE magnesite deposits of Stevens County, Wash., are probably the largest source of magnesite in North America.[1] They are on the east side of the Huckleberry Mountains, about 60 miles north of Spokane. It was not until 1916, when the supply from Austria - Hungary was cut off, that they were mined for magnesite. Before that time they had been worked on a small scale as marble quarries, little or no attention being paid to the high magnesia content of the rock. This was first noted by Shedd[2] in 1902. In 1916 the importance of the rock was recognized practically simultaneously by F. M. Handy, perusing Shedd's report, and by R. S. Talbot, prospecting in the field. Both had a large share in the subsequent development. During the World War, when the need of magnesite as a refractory lining for steel furnaces became urgent, all of the known deposits were worked to capacity. A standard-gage railroad 6 miles long was built to one quarry, 12 miles of grading was completed to another, and a 5-mile aërial tramway was constructed from Finch quarry to the reduction plant of the Northwest Magnesite Company near Chewelah.

When European magnesite reappeared on the American market after the war many of the local companies were forced to stop work. The high cost of labor and transportation to the center of the market near the Eastern seaboard made it impossible to compete with the imported product. Accordingly, the Washington producers closed down during 1921 and 1922. As the domestic industry was essentially an outgrowth of the war, and therefore warranted government protection, Congress, in 1922, placed a tariff of $11 a ton on imported dead-burned magnesite. The Northwest company resumed operations in 1923, and since then has worked continuously. At present only two of the six rotary kilns are in operation.

Magnesite (magnesium carbonate—$MgCO_3$) occurs in two forms. The variety found in Washington, unlike the better-known amorphous magnesite of California, has a coarse crystalline texture and occurs as massive bedded deposits in dolomite. Austrian magnesite is also of coarsely crystalline and occurs as lenticular deposits in Carboniferous sedimentary beds. The Washington magnesite is generally light gray in color, although a considerable tonnage of it is reddish brown. Variations in color and texture generally indicate varying proportions of lime and silica, the chief impurities. In the more crystalline rocks it has generally been found that the coarser the texture is, the higher the lime. However,

Table I—Domestic Production of Crude Magnesite

Year	Washington Production	California Production	Tons Imported(*a*)
1916	715	154,259	94,811
1917	105,175	211,663	38,603
1918	147,528	84,077	45,432
1919	106,206	50,020	26,017
1920	221,985	81,782	.....
1921	.....	47,904	66,247
1922	.....	55,790	245,126
1923	73,900	73,350	158,347
1924	52,860	67,240	136,054
1925	56,060	64,600	143,629
1926	79,500	.....	196,318

(*a*) This figure includes calcined material which has been calculated in terms of crude by using the factor 2.1.

there are no general rules for recognizing the different grades by sight; sampling and comparison with type samples are the means used in classifying the rock as ore or waste. It seems remarkable that, with rock containing about 35 per cent waste, sometimes in the form of dolomite and quartz, the silica in the ore is held within

Washing plant of Northwest Magnesite Company at Finch quarry. Dumps in background

3 per cent and the lime to less than 2 per cent. The ore is thus about 94 per cent pure magnesium carbonate.

For the classification of magnesite into the different grades the scheme in Table II, proposed by O. P. Rogers[3],

[1] A discussion of the theories advanced in this article appears on page 858 of this issue.

[2] Shedd, Solon: Washington State Geological Survey, Annual Report. Vol. 2, pp. 87-105; 1902.

[3] Former quarry superintendent, Northwest Magnesite Company.

has been used. It will be referred to from time to time in this article.

In Washington, the magnesite occurs as somewhat lenticular bedded deposits in the Stensgar dolomite, one of the lower members of the intensely metamorphosed in age from the Pre-Cambrian to the Carboniferous, so the Stensgar dolomite is regarded as early Paleozoic. Overlying the dolomite is a comparatively thin bed of argillite, which in turn is overlain by the thick Addy quartzite. Underlying the dolomite, with apparent con-

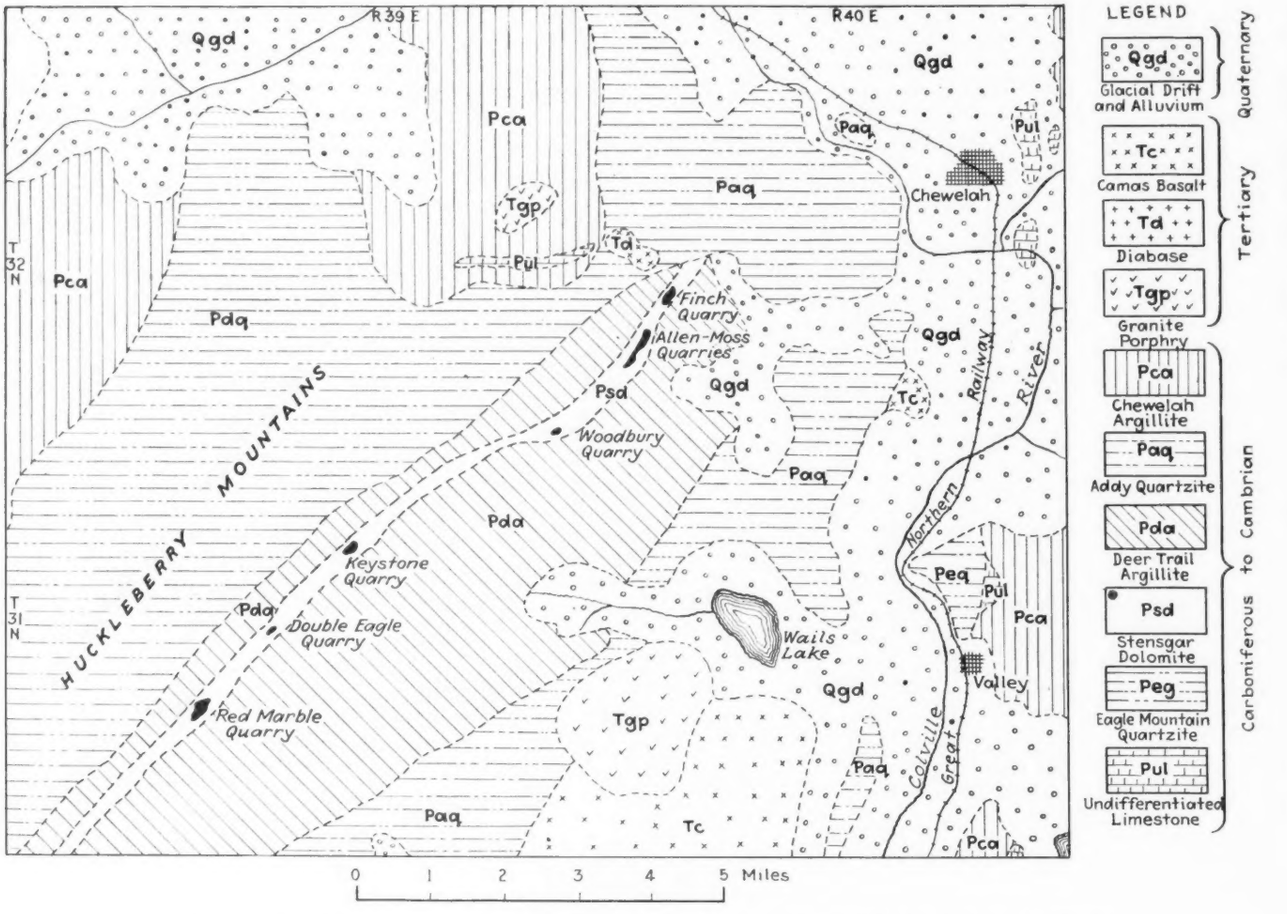


Fig. 1—Reconnaissance map of the Eastern Washington magnesite belt (after Weaver)

Stevens series described by Weaver[4]. As seen in Fig. 1, the Stensgar dolomite forms a persistent narrow belt beginning 5 miles west of Chewelah and extending along the east side of the Huckleberry Mountains for about 20 miles. The southern end of the belt is about 10 miles south of the Red Marble quarry. It varies in width considerably and does not attain a thickness of over 1,200 ft.

Because of the lack of fossils, the age of the Stensgar dolomite and the associated magnesite cannot be determined accurately. According to Weaver[5], its stratigraphic position is 6,000 to 7,000 ft. above the bottom of the Stevens series, which is thought to have a maximum thickness of 42,000 ft. The Stevens series varies

Table II—Classification Table for the Grades of Magnesite

Grade	Limits	
	Silica, Per Cent	Lime, CaO, Per Cent
High grade	Under 1	Under 1
Good ore	1 to 3	1 to 2
Fair lime	Under 2	1 to 3
Fair silica	1 to 4	Under 2
Poor silica	Over 4	.....
Poor lime	.....	Over 3

formity, is another bed of argillite. The argillite above and below, together with some phyllite, schist, narrow bands of limestone, and small discontinuous bands of quartzite, below, have been grouped by Weaver under the name of Deer Trail argillite. Bailey Willis[6] in a later report designates the dolomite formation as the Keystone dolomite and refers to the formation overlying it as the Addy slate and the underlying formation as the Chewelah slate.

The Stensgar dolomite and associated formations in the vicinity of the magnesite deposits have a general northwesterly dip. The structural relationship, however, is complex. As a result of igneous activity and faulting, beginning in the Mesozoic and continuing through the Tertiary, these beds have been considerably deformed. Bailey Willis[7] has recognized the complexity of the structure, and, after mapping a fairly large area that includes all of the known magnesite deposits, has concluded that the dominant structural feature was overthrust faulting with the attendant repetition of beds. Weaver[8], in a reconnaissance of Stevens County, reported that the Stensgar dolomite together with the Deer

[4]Weaver, Charles E.: Washington Geological Survey, Bulletin 20, p. 53.

[5]Weaver, Charles E.: Washington Geological Survey, Bulletin 20, p. 53.

[6]Private report to the Northwest Magnesite Company.

[7]Oral communication; Washington Geological Survey, Bulletin 25, p. 31.

[8]Weaver, Charles E.: Washington Geological Survey, Bulletin 20, p. 53.

Trail argillite and Addy quartzite, in this locality were part of the northwest limb of a closely appressed and overturned anticlinal fold, the axis of which trends about N. 20 deg. E. It appears, therefore, that the series including the magnesite is one limb of a broad overturned fold which has been deeply carved by erosion and considerably complicated by igneous intrusion and subsequent faulting.

The Deposits

The extent of most of the deposits in the district has been fairly well determined. Rough estimates by the U. S. Geological Survey and the Washington State Geological Survey place the total reserves at from five to seven million tons. These estimates, however, are not conclusive. Of the four larger deposits, three have been sufficiently explored by diamond drilling to make it possible to outline the ore rather definitely. These are the Finch, Allen-Moss, and Keystone deposits. The other, the Red Marble deposit, is by far the largest, but so far it has not been explored by diamond drill. Correlation of the different sections after diamond drilling and analysis of the cores makes it possible to estimate the tonnage of the various deposits and the grade of ore. Sampling of the exposures and of quarry cuts, where possible, is of assistance in making this estimate and in outlining the orebodies.

The Red Marble deposit is the most southerly of the larger orebodies in the district. It is exposed on a rather high bluff on the side of the canyon and is easily studied. Here the ore differs from the other deposits in being reddish brown and generally of rather fine texture. Probably this difference results from a later intrusion of meta-diabase into the magnesite area. The fact that only a little quarrying has been done, and no diamond drilling, leaves the origin of the deposit somewhat obscure.

From the Finch deposit, which is probably next in total tonnage, has come the principal production of the district. It is situated about 5 miles west of Chewelah on the north end of the Stensgar dolomite belt (see Fig. 1). The magnesite is more resistant to weathering than the surrounding rock and forms a rather bold outcrop on the side of the gully, which cuts across the strike of the beds at this place. This deposit has been more extensively developed than any other in the state and has well-defined limits. It shows distinctive sedimentary features, throwing light on the origin of the magnesite.

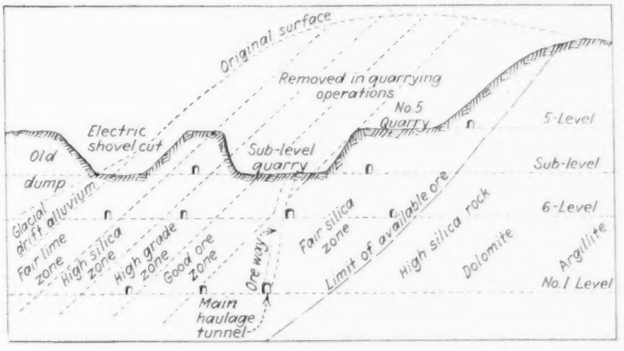


Fig. 3—Generalized section along line A—B shown in Fig. 2

The magnesite area is about 1,000 ft. long and 500 ft. wide. As will be seen from the cross-section (see Fig. 3), the prevailing dip is about 40 deg. to the west. On the west side of the main deposit the magnesite is found in

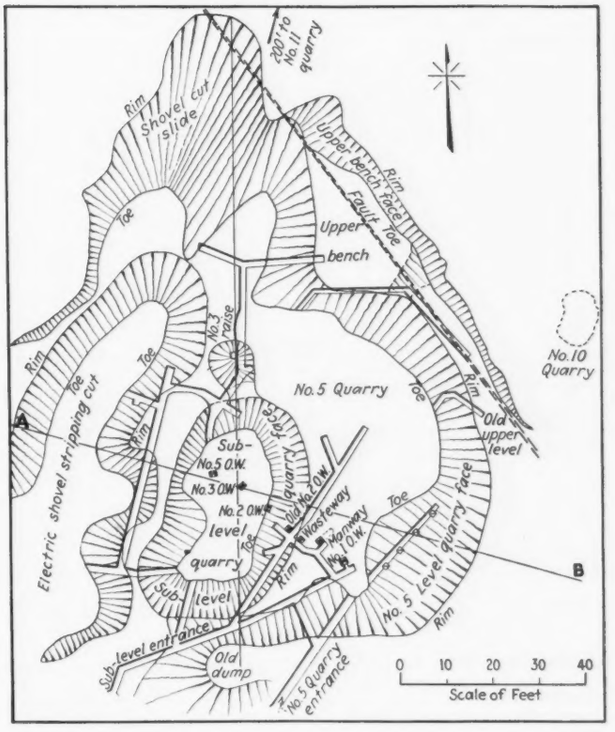


Fig. 2—Map of the main Finch quarry. Lower levels (Nos. 1 and 6) not shown

contact with alluvium and glacial drift. In this section the magnesite is high in lime and shows no marked tendency to fracture along the bedding planes, but has numerous bands differing in color and texture that are conspicuously indicative of the inclination of the beds. The "high-silica" zone underlying this to the east as a whole conforms to the dip and is noticeably slaty, also, in conformation with the dip. All of the rock in this zone is rejected as waste. The high-grade zone underlying it is massive and seldom reveals features indicative of the dip. It grades, however, into the "good-ore" zone to the east, which breaks up into narrow layers sometimes only half an inch in thickness. The "fair-silica" zone underlying the "good-ore" zone is decidedly slaty. Narrow layers as small as an eighth of an inch in thickness can be produced on breaking the rock. At places the rock reveals small ripple marks measuring as much as half an inch from crest to crest. It would appear from these ripple marks that the magnesite here was laid down in fairly shallow water. Twenhofel[9] writes that magnesium carbonate in some cases is laid down originally in fairly shallow water. Below the "fair-silica" rock the magnesium content of the ore gradually diminishes and, with many thin interbedded layers of dolomite, finally grades into massive dolomite.

The principal deposit at Finch quarry is terminated on the north (see Fig. 2) and south by nearly vertical faults. On the south of this main deposit is the old No. 1 quarry and to the north are the No. 10 and 11 quarries. The first work was done at the No. 1 quarry for the reason that it was at a lower elevation and more accessible than other deposits. During the rush of the war days there came a time when "almost overnight" the magnesite in the No. 1 quarry terminated against a fault. In the exploration that followed it was found that a larger body of ore lay to the east and behind the fault.

[9]Twenhofel, W. H.: "Treatise on Sedimentation," p. 263.

This is now the main body and is mined as the No. 5 quarry. Besides being limited on the north and south by faults, it is probably limited on the west also by faulting, as is indicated by diamond drilling. The fault zone on the north, which makes an angle of about 45 deg. with the strike, reveals quartz fissures up to 2 ft. in thickness as well as considerable altered argillite. The area north of this fault zone includes the No. 10 and No. 11 quar-

Finch quarry and surrounding territory, looking southeast from a nearby peak

ries, which have a rather complex structure. Contiguous areas about the No. 11 quarry have been drilled sufficiently to reveal a fairly large block of available "fair-lime" ore. Underground development from the main deposit is now making progress in this direction. The No. 10 quarry was "bottomed" in high-lime rock. At a slightly lower level argillite was found. In this particular locality it appears unlikely that a large body of magnesite will be found. Some workable areas may be found east of No. 10 quarry.

The Allen-Moss deposits have been worked in a number of quarries scattered over a low hill about a quarter mile south of the Finch quarry. The magnesite area, which is about 1,500 ft. long and 300 to 400 ft. wide, is limited on the north by a fault, probably concealed in the ravine leading to the Finch camp. This fault is indicated by the fact that the strike and dip of the Finch and Allen-Moss deposits are so divergent. A strike fault limits this magnesite area on the east, and it is likely that such a fault limits it also on the west. The southern extension of the deposit is complicated by faulting, but so far this boundary has not been accurately determined. The magnesite on this property is found in a series of complexly faulted blocks, generally inclined from 5 to 15 deg. northwest and trending about N. 45 deg. E. Owing to erosion and faulting, there is no complete succession of the magnesite beds, as at the Finch deposit, but a general similarity is apparent. Though the total thicknesses are about the same, the physical characteristics of the various horizons are different. Erosion has left only a thin remnant of the top member, which is classed as "fair-lime" rock. Below this is a rather shaly bed of dolomite 15 to 30 ft. thick. This horizon has a fine texture and, with the noticeably shaly structure, it is similar to the high-silica zone of the Finch. Under the dolomite is a zone which has the appearance of the high-grade zone of the Finch, but on analysis proves to contain only "good ore." The difference in composition is possibly accounted for by more pronounced alteration brought about by the fractured condition of the rock, which is rather light in color and medium coarse in texture. Below it the magnesite grades into a dark, rather coarsely crystalline rock ranging from "good ore" to "fair-silica" ore. A prominent strike fault cuts across the center of the deposit, breaking the succession at this horizon. The bed which apparently comes next below consists of dark gray fairly coarse-grained "fair-silica" rock about a hundred feet thick. It is generally coarser in texture than the corresponding bed in the Finch, but has the same tendency to break in thin layers, although less pronounced. The fact that this rock is a little high in lime substantiates the idea that the coarse-grained rocks are higher in lime. Below this "fair-silica" ore comes a bed of dolomite more than a hundred feet thick. Lying against it, on the east side of the deposit, is a small, narrow exposure of basalt which is difficult to correlate in view of its isolation from other igneous rocks.

The Keystone deposit, which is near the middle of the magnesite belt, is generally regarded as "fair-lime" ore. It is about 600 ft. long, 300 ft. wide, and about 200 ft. thick. The rock is generally rather dark gray and somewhat coarse grained. Willis reports an overthrust fault as the main structural feature in this deposit. The orebody is different in having a rather large amount of brucite developed along this fault, in association with a narrow igneous dike that cuts into the magnesite area. Before the demand for magnesite became so urgent this brucite was quarried for ornamental stone. For calcining purposes brucite is useless on account of the large amount of water held in combination. The magnesite in this locality is found in a prominent outcrop that is noticeable for many miles.

Origin of the Washington Magnesite

Magnesite deposits have been divided into four main classifications according to mode of origin: (1) Magnesite as a sedimentary rock; (2) magnesite as an alteration of serpentine; (3) magnesite as a vein filling; and (4) magnesite as a replacement of limestone and dolomite.

The magnesite deposits of Washington as well as those of Austria and Quebec have been ascribed by Bain[10] to the class occurring as a replacement of limestone and dolomite. In this class the magnesite occurs as a replacement of limestone or dolomite through the agency of magnesia-bearing solutions of magmatic origin.

The Washington deposits, however, have many distinctly sedimentary features. First, the deposits occur in beds with definite strike and dip. Second, the deposits occur between sedimentary formations without unconformity. Third, there are many internal sedimentary features, such as ripple marks, bedding planes, and banding of sedimentary origin. Invariably where the dikes and faults cut through a magnesite body, the rock is noticeably altered and the magnesium content of the ore is decreased. In no deposit except the Red Marble can any direct connection be made between the magnesite and

[10]Bain, G. W.: "Types of Magnesite Deposits and Their Origin." *Economic Geology*, Vol. 19, No. 5, 1924, pp. 412, 433.

solutions of magmatic origin, and even in that deposit the magnesium ratio has probably been lessened. Generally speaking, the further away from a fault or dike in a magnesite body, the higher the magnesium content. Thus, all of the evidence seems to point overwhelmingly to a sedimentary origin for these deposits, as was the conclusion of Whitewell and Patty[11].

Sequence of Deposition

To say that these deposits had a sedimentary origin implies that magnesite as magnesium carbonate was laid down more or less locally as a direct chemical sediment during early Paleozoic time in comparatively shallow depths under marine conditions. The calcium carbonate and magnesium carbonate making up the Stensgar dolomite were laid down at the same time and under the same conditions. The sediments thus deposited had superimposed upon them, later in the Paleozoic, thousands of feet more of various other sediments, after which there was an epoch of uplift, folding, and igneous intrusion. This period of dynamic metamorphism probably began in the Mesozoic and lasted through the Tertiary. During this time the magnesite was metamorphosed into its present crystalline condition, and finally tilted into its present position. This mode of origin is assumed for all of the deposits, except that in the Red Marble and Keystone deposits there has been additional alteration, by which the former was changed into reddish, iron-bearing magnesite and the latter was changed in part into brucite. These additional changes probably took place in the Tertiary.

Because the Finch and Allen-Moss deposits were less altered by these later agencies, they are more definitely indicative from a genetic point of view. The pronounced bedding planes and ripple marks found in the east side of the main Finch quarry, and the high silica zone, with the other zones of more or less regularity, all conforming in dip, point to a direct sedimentary origin. With the exception of the "high-grade" zone, it is always possible in the main Finch deposit to get some idea of the inclination of the beds. Where the bedding planes have not been sufficiently developed, it is generally possible to find variations of either texture, color, or composition which are indicative of the dip. The Allen-Moss deposits show almost as pronounced sedimentary relationships, except that no ripple marks were found. Here, however, the rock is more intensely faulted, and the sedimentary features are therefore more obscure.

Theory of Origin by "Local Leaching" in an Inland Sea

The exact conditions under which the magnesite was laid down are matters of some little conjecture. Opinions differ regarding the general aspects of the origin of magnesium carbonate rocks, and the fact that this region is one of complex structure further prevents an adequate explanation. Whitewell and Patty[12] sum up the early stages of origin by postulating an inland sea or lagoon in which the mixed salts of calcium carbonate and magnesium carbonate was precipitated. It is supposed that by *local leaching* action in a somewhat unconsolidated stage some of the more soluble calcium carbonate was removed, leaving the later metamorphic agencies to consolidate and crystallize the remaining magnesium carbonate into the hard magnesite and also to convert the outlying mixed salts of calcium and magnesium carbonate into dolomite.

Whether the concentration of the magnesite was effected by local leaching of the calcium carbonate from the mixed carbonate, as suggested by Whitewell and Patty, or whether the magnesium carbonate was laid down directly as a chemical precipitant or sediment, has not been definitely determined. Eckel[13] classes the Washington magnesite with deposits which may have been formed as a result of direct deposition or precipitation of magnesium carbonate from bodies of concentrated saline waters.

Magnesium carbonate deposits that have been formed directly are also found in some of the magnesite deposits of California. Gale[14] describes such a deposit at Bissell, Calif. This deposit is small, the magnesite bed being only from 6 to 10 ft. thick, and occurring with clay, clay-shale, and limestone, probably of Tertiary age. This deposit is thought to have been formed by the precipitation of magnesium carbonate from waters rich in magnesium and containing sodium carbonate. Bradley[15] describes a somewhat similar deposit, in San Bernardino County, Calif. This deposit is about 1,000 ft. long and varies from 30 to 100 ft. in thickness, the dip being about 40 deg. Near the footwall, the rock is more compact and stratified, varying from massive to thinly laminated. The magnesite near the hanging wall is described as being nodular in form, varying from egg-size to boulders several inches in diameter. That the feature of nodules or concretions in this deposit is indicative of a direct, contemporaneous mode of origin is inferred from Twenhofel.[16] He states that impervious rocks such as shale, limestone, and dolomite (and magnesite) are favorable for syngenetic or direct formation of concretions and nodules.

Geological Conclusions

These examples are cited in support of the theory that the Washington magnesite was deposited directly and contemporaneously as magnesium carbonate. In view of the fact that there are no magnesium-bearing rocks in the area to which the magnesite may be traced for its origin, it seems useless to postulate simple replacement reactions to account for its occurrence. Most of the igneous intrusions are of later period than the magnesite, and there are no known sedimentary beds older than the Stevens Series from which the magnesite might have been derived. The original source rock for the magnesite must lie beyond the border of this area. This implies that reactions leading up to the dissolving of the magnesium carbonate must be inferred because there appears to be no evidence in the district pertaining to the original reactions. The present information indicates only that the reactions resulted in the precipitation of magnesium carbonate much in excess of the ratio of dolomite and that this magnesium carbonate, after becoming indurated, has not been replaced or altered chemically, except as has been noted in the technical discussion of the Red Marble and Keystone deposits.

Acknowledgment is due to Mr. R. B. Rogers, general superintendent of the Northwest Magnesite Company, and to Dean F. A. Thomson of the University of Idaho for help in assembling the data and material that have made possible the preparation of this paper.

[11]Whitewell and Patty: Washington Geological Survey, Bulletin 25, p. 33.
[12]Whitewell and Patty: Washington Geological Survey, Bulletin 25, p. 35-39.
[13]Eckel, E. C.: "Cement Limes, and Plasters," p. 150.
[14]Gale, H. S.: U. S. Geological Survey, Bulletin 540; p. 512-516.
[15]Bradley, W. W.: "The Magnesite Deposits of California," California State Mining Bureau, Bulletin 79, p. 73.
[16]Twenhofel, W. H.: "Treatise on Sedimentation," p. 511.

DISCUSSION

Some Geological Features of the Washington Magnesite Deposits

THE EDITOR:

Sir—Through the courtesy of Mr. Siegfus I have had the privilege of reading his paper on the Washington magnesites (which appears elsewhere in this issue). I appreciate his contribution to the knowledge of the subject and have considered the problem of origin as he presents it. I have also looked over the collection of specimens made during my own examination some years ago and reviewed the descriptions contained in my (unpublished) report to the magnesite company.

I regret that I cannot agree with Mr. Siegfus in regard to the sedimentary origin of the magnesite being proved or even probable.

He demonstrates what I think no one will question—namely, that the strata in which the magnesite is found are of sedimentary origin. They are without doubt metamorphosed sediments. Nor will any one question the original more sandy or more clayey composition of the more siliceous or argillaceous dolomites. The silica and alumina are characteristically distributed in certain strata with a somewhat higher percentage than in other beds.

It is otherwise with the magnesite. Although associated predominantly with dolomite and therefore occurring in certain strata, the mineral is secondary. It occurs in masses, veins, and individual crystals in the dolomite. In some cases it forms strata; elsewhere it occurs as a coarsely crystalline aggregate abutting abruptly against fine-grained dolomite. Calcite veins occur in similar relations, but not so abundantly.

The magnesite deposits are irregular occurrences restricted to positions beneath overthrust faults. Usually a fragment of the Stensgar dolomite lies beneath and is protected from erosion by a quartzite, which is thrust upon it. The dolomite is sheared by many minor faults and is sometimes crushed. Magnesite is deposited as a secondary mineral where the crushing has produced the more open texture or where an impervious, less fragile layer in the dolomite has directed and promoted the action of waters.

If it be agreed that the crystalline magnesite is a secondary mineral (and I do not see how it can be questioned), there is still the unsolved problem of its origin. In regard to this, Mr. Siegfus's view that the original form of the deposit was that of a pure chemical sediment should be considered as a possible alternative. Another hypothesis would relegate the magnesia to the dolomite, leaving the moot question of the origin of that rock. Still a third theory would attribute the magnesia to an extraneous source and would explain its introduction into the crushed dolomite as being due to the action of waters flowing along fault fissures under the control of impervious surfaces.

The investigations of the deposits, including my own, have in my judgment failed to discover the criteria by which these several hypotheses may be tested. I therefore consider the problem of the origin of the magnesia as unsolved, though its actual condition in the formation is that of a secondary mineral, concentrated on or near faults.

BAILEY WILLIS.

Palo Alto, Calif.

* * * *

On the Ease of Replacing Leaders in Research and Invention, and Other Topics

THE EDITOR:

Sir—In your editorial "Research and Invention," in the Oct. 29 *E. & M. J.*, you state that Dr. Karl T. Compton's "contention is true and his deduction just" when he "holds that the research worker is basically responsible for the discoveries that have provided the conveniences and luxuries of modern life, and that the inventor merely turned these discoveries to practical account."

What is the true measure of service? The question leads to conclusions that will run counter to some of the pet ideas of those who claim they want to see fair play among the partners of industry. Both inventor and research worker are claiming more credit than is their due. Both ignore the part played by the common herd. The common herd apparently derives the benefit of the labor of the inventor and research worker without contributing anything. This is bunk. Everyone, in the past and in the present, directly and indirectly, has contributed something to every invention and discovery. In reality, so little does anyone contribute in comparison to the benefits derived from the efforts of the rest of humanity, past and present, that the claim of unusually great rewards and honors is a claim for something none deserve.

We are told that if it were not for the inventions of about twenty-five inventors and the discoveries of about ten or twelve scientists we would still be swinging stone axes and tilling the soil with wooden hoes. The fact is, if all the great inventors, scientists and statesmen in the world today died tomorrow, in one week we would be going along as if nothing had happened. Men would immediately spring up to take their places and would invent and discover just as great things. We have got into the habit of thinking that the power some men wield is their power, instead of the power of some position in an organization—a civilization—created by the efforts of billions and trillions of men, past and present. We are all recipients of benefits that none can repay. How, then, shall we measure services rendered?

Services cannot be measured by results. To attempt it we would have to take into account the part played by the rest of humanity, past and present. Another reason why we can't measure by results is the part played by

natural resources, which are variable. The part contributed by humanity may be called social resources. Our natural and social resources do not rightfully belong to any one. They are the heritage of all. For that reason they should be free and without charge. They should, no matter how stored in commodities, pass through all exchanges free and without charge. If the natural and social resources cannot be rightfully charged for, what, then, can an individual rightfully charge for, what can he own to the exclusion of the whole world?

The above is not socialist doctrine. In the only way that really counts, government ownership of the natural and social resources is no different than private ownership. Both would charge for the use of them. If it is wrong for an individual to charge for the use of the natural and social resources, then it is wrong for a government to do so. One has no more right to "own for a living" than the other. Where there is ownership of resources, those who would use them must pay tribute to those who do not want to use them. Our resources belong only to those who would use them. Stating what we cannot rightfully charge for helps us in deciding what we can charge for. WILLIAM CROCKER.

Prescott, Ariz.

* * * *

Gold Prospecting in the Sauerkraut Belt

THE EDITOR:

Sir—The discouraging feature about the examination of a prospect is the tendency of all of its meritorious aspects to vanish under the unsympathetic scrutiny of the examining engineer. Then comes the uninteresting but necessary task of casting negative conclusions and their sustaining facts (or defects) into a mold officially known as a report. Perhaps most engineers make too formal reports covering properties that should be dismissed with a casual shrug of the shoulders. At any rate, the following report shows a sense of perspective:

Report on an Expedition into the Sauerkraut Belt of Pennsylvania Under the Chaperonage of Reverend John Doe

Indications of gold in the district visited are numerous and are listed below in the order of their importance:

1. Grandma Doe found flakes of some yellow material in the crop of a goose she killed. I did not see the goose nor Grandma.

2. The Indians told the early settlers that they would some day shoe their horses with silver shoes fastened with gold nails. Both Indians and early settlers have vanished.

3. The particular lands examined are said to be good for nothing else. This is hearsay but probably reliable.

4. Rock from a prospect shaft was said to run $20 to the ton in gold. The assay card shows 20c. a ton, indicating that the decimal point has slipped.

5. A jeweler in Philadelphia said his uncle had panned gold in the Schuylkill Valley. Uncle died in the early '70s without disclosing the locations of his diggings. According to reports, he was afflicted with rheumatism and probably other vices.

6. A mine near Cripple Creek, Colorado, had $15 gold ore at a depth of 150 feet and $1,500 ore at 1,000 feet. Important if true and should be investigated.

7. The whole territory has changed remarkably in the last forty years. This is admitted by all the old settlers. Its bearing on the gold resources of the district grows on one with repetition.

8. Assurance was given that the values would increase with depth, placing the property on a par with practically every mineral prospect from the Arctic Circle to King Solomon's mines.

9. The samples taken will not do justice to the property. They never do.

This report is made entirely on the basis of information furnished by Mr. Doe and without any reference whatever to the examination of the property.

Pennsylvania. PHILLY DELPHIA.

* * * *

Workmen's Compensation Insurance in California

THE EDITOR:

Sir—The intention of workmen's compensation insurance—to remove those injured by industry from dependency upon society—is reacting against labor in California, due to drastic decisions by those charged with the enforcement of the law. As a result of such decisions, many employees who have physical disabilities are being discharged and are unable to secure other employment. Often an employer would be pleased to retain those physically handicapped, but he realizes that should they receive another serious injury, it is possible that he would be penalized for employing them. So medical examination for would-be employees is being rapidly adopted in California; thus the physically unfit are being weeded out.

A recent decision by the Superior Court of California was apparently one of the factors affecting the physically unfit, for by this decision a precedent was established whereby the last employer was forced to pay compensation insurance to a physically unfit employee for loss of the sight of both eyes. It seems that this man at the time of employment by a certain concern had already lost the sight of one eye. An accident occurred whereby the sight of the other eye was also lost. The last employer was charged with total permanent disability, which provides for 100 per cent rating, which will entitle the employee to 65 per cent of his average weekly earnings for a period of 240 weeks; and thereafter 40 per cent of such weekly earnings during the remainder of his life. It is estimated that if the employee lives for 25 years from the time of the accident he will have received $14,000. To show how far reaching this decision is, a recent case occurred at one of the Californian mines whereby an employee who had lost the sight of one eye was discharged on the grounds that should he lose the sight of the other eye the employer would have to pay 100 per cent disability. The work this man was engaged in was such that he could easily have performed his duty, but the employer realized that he could not afford to be penalized in case of an accident. Physical examinations are thus causing unemployment, a condition that was never intended to exist by those who conceived the idea of workmen's compensation insurance.

The mining industry in California has suffiered greatly from the cost of workmen's compensation insurance, the rates for which have been increasing yearly. It is not unusual for a mine to pay as high as $30,000 a year in premiums to a compensation insurance carrier, so that employees can be properly protected in case of injuries. This sum represented in one case a cost of 50c. per ton of ore milled, which is often the difference between profit and loss. Gold mining suffers in particular, because this cost cannot be charged to the consumer, as is done by those engaged in other industries.

The question arises whether or not labor desires to continue to suffer as a result of the existing conditions or will it make an effort to correct defects in the law so those with physical handicaps can be employed.

San Francisco, Calif. G. CHESTER BROWN.

By the Way

Indoctrinating The Navy

"THE difficulty with physical methods of ore detection or ore location in the main," said Dr. Max Mason, in presenting his paper on "Geophysical Exploration for Ores" recently at the joint society meeting in New York, "is just about the same as the difficulty of submarine detection when it comes to what we used to call 'indoctrination of the Navy.' You first had to take a given piece of apparatus and make it strong and sound and then you had to prove to the Naval officers that it really would work, but then after you got through you had to prove to them it wouldn't do everything in the world it wouldn't do. So you first had to run against skepticism and then later you had to calm the enthusiasm.

"I remember curing some skepticism and producing a little bit too much enthusiasm at one time. I was on a destroyer in the North River waiting to go across the ocean with a convoy and was calibrating one of the detection devices which we had just put on this destroyer. I will say this was an acoustic device used to focus sound, and through turning a dial to focus it one could determine the direction from which sound came, but that is all you could determine. When you were familiar with different types of boats you could make a good guess as to what type of boat it was, and the trained listeners were remarkable in being able to tell what was going on aboard a submarine; whether the diving rudders were being moved or whether the ballast tanks were running, or things of that kind.

"In the North River, then, I stood on this destroyer one day and was asking an officer to have shouted down through the voice tube to me in the bottom of the ship the exact bearings taken by Polaris of ships as they came up the river, in order that I could compare those bearings with the bearings I got on the instrument and then correct the scale. He was very skeptical of the whole thing, not being an Annapolis man, but having come through the ranks, and he commenced to sneer at me for the fact that he had to tell me where the ships were and in between times he would say, 'Can't you tell me where they are instead of my telling you?'

"I said, 'I am calibrating,' but I don't think he ever heard that word before.

"But he got more and more obstreperous as time went on, and asked me if I heard a ship that went by on the port hand, saying, 'I should think you would have heard that; they went right by.'

"Fortunately, within a few moments I had an opportunity to nail him, because I heard in the instrument the most peculiar engine noise which I had ever heard and one which I had listened to that same morning. This ship had a peculiar break in the rhythm combined with a squeal at one point in the revolution of the propeller, caused by the fact that the lignum vitæ block through which the shaft went was worn, and you could hear the thing above the rumble of the engine. I had heard it in the morning and been so interested by the peculiar break in the rhythm that I went on deck and took a very careful look at the ship as she went by. So this afternoon, then, when my friend was objecting to the instrument, I was fortunate in hearing this same boat coming back up the river. So I said, 'I am through calibrating and if you will stand by I will give you an exhibition of what this instrument can do.'

"I said, 'She bears 20 degrees and is coming up the river at 12 knots.'

"He said, 'Why, but there are lots of boats down there.'

"'She is 30 degrees and she is in line with the New York smokestacks.'

"He said, 'By golly, that is right.'

"'She is coming in fine now. She bears 37 degrees and is about 250 feet long. She is now bearing 45 degrees, has three decks, two funnels and is painted dark red.'

"He didn't make any response at all through the voice tube, but about ten seconds later I heard the deck clatter over my head and he stuck his head over the hatch and said, 'Let me listen a while, will you?'"

Consultation

Ball Mills in Metallurgical Plants

"Can you supply me with some information about the introduction of tube mills or ball mills in the metallurgical industry, and when they were first used?"

As far as can be ascertained, the cylindrical mill now common in metallurgical plants was adopted from a similar type of machine used in the manufacture of porcelain. The Alsing mill, as it was termed, was used in 1880 in Cornwall, on tin sand. The first recorded use in a metallurgical plant, so far as we have been able to ascertain, in the United States, was at Wickes, Mont., where an Alsing pulverizer 5 ft. in diameter and 8 ft. long, using flint pebbles, was employed in some metallurgical operations. The feed and discharge were continuous. Later a similar type of mill 15 ft. long was used, lined with cast iron and using chilled-iron grinding balls.

We will be glad to receive any corrections or amplifications of this statement that readers may care to supply in regard to the early history of the cylindrical mill as a grinding unit.

A Furnace for Burning Limestone

A correspondent in Central America writes as follows:

"I have been a user of lime at mining properties for the past 15 years and have had to learn by experience how to make it.

"The methods we have used seem to me to be crude and expensive, and I would like to know of some other cheaper and probably more efficient manner. We build an oven, which is generally a hole cut into a hard rock in a bank of soft rock or very stiff clay and reinforced in front with plastered rock. This oven holds about ten tons, and a crown of larger stones of lime or calcite is made upon which the lime rock is filed until the oven is full. Then firewood is burned under the crown from four to seven days, night and day. The oven is allowed several days (two or three) to cool, then the crown is broken down, after the embers and ashes have been drawn and the lime pulled out of the fire door.

"I have read and been told of furnaces which could be easily built in which lime could be continually burned and drawn off without stopping to cool off and reload, but I have been a reader of the *Engineering and Mining Journal* for fifteen years and have never seen a description of such an oven.

"If you know of any article on this subject or a textbook describing the building of such a continuous wood-burning oven for burning lime, I would appreciate the information. I want to burn about 30 to 40 tons per month and want to economize on fuel. We have only wood fuel."

We would be glad to hear from any readers who have operated a continuous kiln of the type described.

NEWS OF THE WEEK

Summary

IN CONNECTION with its exploratory operations in the Southwest, the U. S. Bureau of Mines begins a special study of potash at its New Brunswick station.

* * *

President, in ordering an increase in the duty on both crude and calcined magnesite, departed from the plain implication of the Tariff Commission's report. It was not the intention of the Commission that the rate be increased on the crude product.

* * *

Insects and plant diseases, rather than sulphur fumes from Magma Copper Company's smelter, are held responsible for damage to rancher's property near Florence, Ariz., by jury after visit to orchard and garden of plaintiff.

* * *

Prospectors in Alaska enter a new district along the Chickamin River, where an extension of the Coast Range contact was found last summer by a field party of the U. S. Geological Survey.

* * *

New Guinea's gold fields are declared to be tremendously rich. Six airplanes are conveying passengers, stores, and gold between the inland district and the seacoast.

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Noranda Mines plans to build 500-ton concentrator at the Horne property; new milling plant will be situated near the smelter and be in operation next spring.

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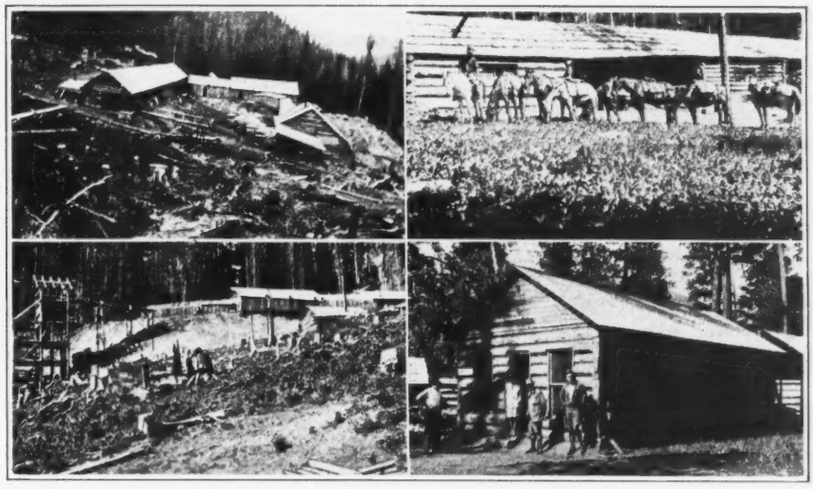
Mexican press speaks kindly and enthusiastically of the work of Dwight W. Morrow, the new American ambassador.

* * *

Three directors of the North Butte Mining Company are removed at a recent meeting of stockholders.



Upper and lower left—Yellow Pine Syndicate's camp on Cinnabar Creek. Upper right—The Meadow Creek camp. Lower right—Post office and store at Yellow Pine, Valley County, Idaho

Bradley Interests Establish Camps in Valley County, Idaho

Yellow Pine Syndicate Transports Supplies by Motor Truck and Pack Horse—Development of Properties Depends on Construction of Road

VALLEY COUNTY, Idaho, activities have been increased by the entrance of the Fred W. Bradley interests, which are planning to take an active part in the development of the mineral resources of the region. The United Mercury Mines holdings have been taken over on a bond and lease by the Yellow Pine Syndicate, headed by Mr. Bradley, as president. The other officials of the syndicate are: C. G. Dennis, manager; P. R. Bradley, consulting engineer; E. A. Griffin, secretary; J. A. White, superintendent; and J. J. Oberling, Boise agent. Mr. Bradley is president of the Bunker Hill & Sullivan Mining & Concentrating Company.

The operations of the Yellow Pine Syndicate are centered around two groups of properties: One, the Cinnabar group, on Cinnabar Creek, a tributary through Sugar Creek to the east fork of the south fork of the Salmon River; the other, the Meadow Creek gold property, situated a mile south of Meadow Creek, which also flows into the east fork of the south fork of the Salmon River. Camps have been established at both groups of properties.

During the last summer, examination of the properties by C. G. Dennis, manager of the syndicate, convinced him that by combining the two properties—the Cinnabar and the Meadow Creek—the government might become sufficiently interested to construct a road into the district up the east fork of the south fork of the Salmon River and that the properties might be equipped and developed profitably. Future plans for development and equipment of these two properties depend a great deal on what progress is made in securing government aid in the construction of the proposed road into the district.

New Site Selected for Meadow Creek Camp

At the Meadow Creek property, a new camp has been started that will open the gold lode at an additional depth of 500 ft. vertically and at a distance of 14,000 ft. from the former camp. Fifty tons of supplies are being transported by motor truck and pack horse to the Bradley camps. Supplies are hauled by truck. from Cascade to Yellow Pine, and from Yellow Pine to the mine, a distance of about 10 miles, pack-horse

transport being used, following the south fork of the Salmon River.

The country rock of the Meadow Creek property, which is believed can be developed into an important gold producer, is a granodiorite intruded by alaskite and lamprophyric dike rocks. The deposits occur, according to Bulletin 780-D of the U. S. Geological Survey, by Frank C. Schrader and Clyde P. Ross, in a poorly defined shear zone or lode about 500 ft. wide associated with alaskite. The lode consists of crushed silicified and mineralized granodiorite, alaskite and quartz forming the gangue, in which are distributed antimonial silver and gold, argentite, tetrahedrite, and stibnite.

Cinnabar Deposits in Limestone

The cinnabar deposits occur chiefly in limestone that has undergone igneous metamorphism. The silicification, sericitization, and formation of the sulphides were stages in a process of replacement of the limestone by materials introduced by infiltrating fluids. Most of the deposits are irregular, chimney-like masses. Development of the cinnabar mines has been carried on since 1921 by the United Mercury Mines Company. A small amount of quicksilver was produced in the course of this company's operations. This production, however, was not sufficient to make the operation of the milling plant a profitable undertaking.

Discovery of cinnabar in this district goes back to the Thunder Mountain excitement. Although the veins and lodes are considered to be of commercial grade, their remoteness from transportation has prevented development. Practical operators have conceded the value of the claims formerly held by United Mercury Mines, but have hesitated to start development because of the transportation problem.

The Cinnabar camp from the mountainside

Smelter Fumes Not Guilty This Time

TRIAL of a "smoke case" in the superior court at Florence, Ariz., recently, resulted in a verdict for the defendant—the Magma Copper Company—which had been sued by Robert C. McMurry, a rancher living near Superior. The plaintiff claimed damages amounting to $2,900, stating that the sulphur fumes from the smelter of the company had damaged his property to that extent. Among the exhibits introduced in the court room as evidence in the trial were: one tree, a number of plants, and samples of soil from the plaintiff's ranch. The jury, after visiting the orchard and garden of the plaintiff, held that the damage to the trees and vegetables was caused by insects and tree and plant diseases, rather than by fumes from the smelter.

Prospectors Enter New District in Alaska

Extension of Coast Range Contact Found on the Chickamin River West of International Boundary

THE U. S. Geological Survey had a party at work last summer under D. B. Stewart investigating the extension into Alaska Territory of the Coast Range contact in which have been developed several important mines in British Columbia. They found this contact on the Chickamin River at a point 10 miles west of the international boundary, thus opening to prospectors an opportunity of mineral discoveries on the Alaska side and confounding the general belief that the Boundary Commission had given Canada all the mineral wealth worth having in southeastern Alaska. Prospectors have already started work there, but most of the country is as yet inaccessible because of the lack of trails. The main vein on the Monarch group, on Fish Creek, north of Hyder, has been traced for 4,000 ft. It varies in width from a few inches to a foot and a half. The minerals are galena, gray copper, sphalerite and chalcopyrite. Last season's development on the Texas Creek properties of the Hyder Lead Mines, Inc., has been attended with encouraging results. One vein, 2 ft. wide, was stripped for a length of 300 ft., and assays are stated to show high-grade ore. An encouraging feature of the year's development is the persistence of the gold mineralization.

The Singletary property, at Port Wells, in the Valdez district, has been bonded by J. E. Groth with a view to extensive development. According to report, 2,000 tons of ore of good grade is on the dump. Ethel Mining Company has purchased a mill for its property on Mineral Creek. The Ethel is 8 miles from Valdez, and is one of the oldest mineral locations in that district. It was formerly known as the Williams and Gentzler property. The plant will be operated by hydro-electric power. A renewal of interest in the leading gold locations around Valdez is apparent. The Merrill, Sealy-Davis, Ramsay-Rutherford, Gold King, Granite, Big Four, Millionaire, Cliff, Mayfield and Little Giant are regarded as promising properties, and greater activity is being shown in their development than for some years. J. Keller is installing a two-stamp mill on his property at Port Wells.

The gold-quartz discoveries on Valdez Creek, in the Anchorage district, are attracting more than usual attention. These were made by L. A. Powles, formerly chief of police at Anchorage. Three veins are under development, having widths of from 2½ to 36 ft. Two of the veins occupy fissures in diorite and one vein lies in a contact between diorite and slate. The quartz pans gold freely.

A new placer discovery has also been reported on Valdez Creek, opposite Tammany Bench. Gold formerly mined on this creek has been pre-glacial. The new strike is post-glacial. The location of the strike is at a considerable elevation above bedrock and suggests to prospectors the possibility of other discoveries in that part of Alaska under similar geological conditions. J. Carlson and partners have made a good clean-up this season from the old tunnel on Tammany Bench. The gravel is raised to the sluice boxes by means of a hydraulic elevator, which has been giving satisfactory results.

There has been a stampede to Noatak River, in the Kotzebue Sound district, on reports of a new placer discovery. An asbestos deposit is also reported from that locality. A jade mine is worked in the district on Jade Mountain, and shipments of about 1,000 lb. per annum are made to American manufacturing jewelers. A discovery of lode platinum is reported from Good News Bay.

N. W. Rice, vice-president of the U. S. Smelting & Refining Company, has been on a trip of inspection of the development work being carried on at Fairbanks by the Fairbanks Exploration Company. Ruby had a successful summer, good clean-ups being reported from Poorman, Flat, Salmon, Spruce, Greenstone, and Tamarack creeks.

The Goldsmith Gold Dredging Company reports the following clean-ups: Aug. 16, 275 oz.; Aug. 31, 376 oz. The new pay-bench struck at Nome last fall by drilling is 5 ft. thick. It is at an elevation of from 5 ft. to 10 ft. above sea level. Eskimo Dredging Company has disposed of its dredging plant on Solomon River to the Lomen Reindeer Corporation, which plans to move it to Osborne Creek.

Val Klem is developing a stibnite deposit, 4 ft. in thickness, on Cleveland Peninsula, near Cape Camano. The Goldsmith Dredging Company, of Spokane, reports a probable production of $30,000 from its operations on Solomon River at Nome during the last season.

Timbering Resumed in Shaft of Quincy Mine

Will Use Three Crews on Work—No. 6 Shaft at Capacity Production—Values at Mohawk Improve

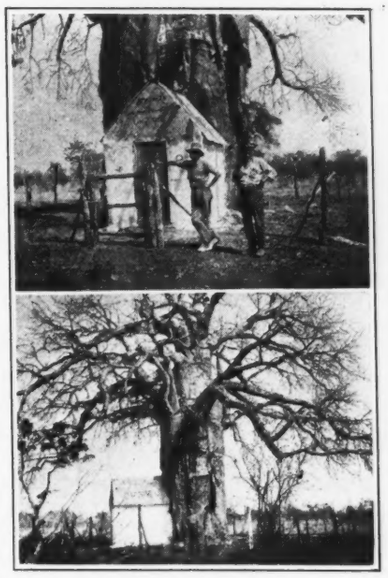
RETIMBERING has been resumed in No. 2 shaft of the Quincy mine, in the Michigan copper district, in which seven men recently lost their lives in an "air blast." The work is being done by two crews, but a third crew will be added soon. No "air blasts" have occurred of late, the ground having settled. Some of the timber sets at the 40 level are being strengthened. As retimbering proceeds, considerable filling will be done to strengthen the shaft walls as a precaution against further cave-ins. Rock for this purpose will be trammed out of old levels above. The most difficult part of the work will be between the 41 and 47 levels where the "air blasts" caused caving, blocking the shaft with rock. Meanwhile, production is proceeding in No. 6 shaft, which is being worked to capacity, about 1,200 tons of copper ore being hoisted daily.

At Mohawk, No. 1 shaft is showing considerable improvement in mineralization in the bottom levels to the south, toward No. 4 shaft. No. 1 is bottomed at the 28 level, but sinking is proceeding to the 29. No. 4 continues to give a good account of itself, yielding ore of fair grade. No. 6, the richest unit, shows no falling off and the vein is wide. The shaft is bottomed at the 26 level, and drifting is under way in the 25 and 26 levels. The bottom stoping level is the 22, the shaft keeping four levels in advance of mining. Mohawk is shipping 2,500 to 2,600 tons of ore per day, which keeps the four heads in the stamp mill working to capacity. Although No. 5 shaft remains idle, it is in good condition and eventually will be reopened. It will yield a large tonnage from pillars and the widening of stopes.

In Calumet & Hecla Consolidated's No. 4 Calumet shaft, which has been idle since the fire in this unit in 1924, sinking is about to be resumed from the 91 level. It will be the only permanent working shaft below the 81 haulage level in the Calumet branch. A tract between the North Tamarack and Tamarack Junior is being reached from the deep levels of this shaft, and mining is proceeding in the 83 level. In No. 7 shaft, which will be the working unit below the 81 level in the Hecla branch, drifting and stoping are increasing.

Satisfactory progress is being made in dewatering the old Cliff and Phoenix shafts, in Keweenaw County, which will be used by Calumet & Hecla Consolidated for exploratory purposes. As the water is lowered in Cliff, fissure veins are found stripped of mass copper. Little or no attention, however, was paid by the early-day miners to the amygdaloid lodes with stamp rock.

The influx of men from the industrial centers continues. More than 50 men have returned to the Calumet & Hecla mines during the last few days.



Company Stores Explosives Within a Tree

AT THE property of the Northern Transvaal (Messina) Copper Exploration, Ltd., 344 miles north of Pretoria, South Africa, a magazine for explosives, large enough to hold 2,000 cases of dynamite, has been built in the hollow trunk of a baobab—*Adansonia gregorii*—commonly known as the cream of tartar tree.

Nicolas Liepner, chairman of the company, says that, although the magazine complies fully with the government mining regulations, there is not another like it in the world. The country north of the Zoutpansberg range of mountains, and in which area the property is situated, is dotted with baobab trees, some of which have a girth of 100 ft. Two views of the magazine are shown in the illustration.

Moulton-Anaconda Appeal to Recent Suit Argued

On Nov. 15, the Moulton Mining Company of Butte, Mont., belonging to the Clark interests, presented before the U. S. Circuit Court of Appeals in San Francisco its arguments against the decision given to the Anaconda Copper Mining Company in a recent suit involving the Badger mine and the Poser claim of the Moulton company. W. E. Colby appeared for the Clark interests and L. O. Evans and D. M. Kelley, of Butte, for the Anaconda company. Judges Hunt, Rudkin, and Deidrich, all experienced in mining cases, heard the arguments. This apex controversy is out of the usual in that the concentration of mineralization involved in the disputed ground is extraordinary. There is a multiplicity of veins, as well as two or more series of intersecting veins, and, to increase the complication, an important fault cuts through the area. Priority of location is conceded to the Poser claim, but the continuity of the Poser vein is disputed by Anaconda.

The trial judge decided against the Clark interests, holding that the Poser vein was discontinuous. The appeal from this decision contends that continuity has been proved by assay samples forming practically an unbroken series. Contention was also made that the "intermediate vein" gives a subfault apex and that one of the branches of this vein apexed in the Clark property, which would give title to the senior vein. A union between the intermediate vein and the "view" vein was claimed, but was disputed by Anaconda. Several elaborate mine models were exhibited and used in explaining the intricacies of the situation.

Spruce Mountain Properties Increase Development

Completion of the tramway from the crest of Spruce Mountain, Elko County, Nev., to the bottom of the hill is being rushed by the Nevada Lead & Zinc Company in preparation for a vigorous program of development. Two mines will be served by this 4,700-ft. aërial tramway—the Black Forest, owned and operated by the Badt-Woodward interests, and the Spruce Consolidated group of the Nevada Lead & Zinc Company—and shipping to Jasper on the Western Pacific Railroad throughout the winter will be made practicable. Capacity of the tramway will be 75 tons in eight hours.

Activity of the Nevada Lead & Zinc Company has been stimulated by the opening up on the 70-ft. sublevel and the 160 level of the faulted ore deposits near the surface which were productive in the early days of the district, 50 years ago.

Production of the Black Forest will be increased now that the connection has been completed between the main tunnel level and the orebodies opened up from upper workings.

North Butte Stockholders Remove Three Directors

At a recent meeting of stockholders of the North Butte Mining Company. Frederic R. Kennedy, John W. Neukom, and W. F. Bartholomew were removed as directors and replaced by Arthur Perham, Dan A. Coleman, and Paul A. Gow, of Butte, Mont. The vote showed 370,908 for removal and 34 opposed to the action.

Bureau of Mines Studies Potash at New Brunswick Station

Special Work Begun in Connection With Exploratory Operations in the Southwest—No Economic Justification for Increase in Duty on Crude Magnesite

By Paul Wooton
Special Washington Correspondent

IN CONNECTION with its exploratory operations in the Southwest, the U. S. Bureau of Mines has begun a special study of potash at its New Brunswick station. The study will be under the supervision of Dr. Oliver Bowles, the superintendent of the station. Two specialists have been engaged to assist in this work. Dr. Oscar F. Neitzker will be in immediate charge. He will be assisted by Dr. J. F. T. Berliner. Dr. Neitzker was graduated from Massachusetts Institute of Technology in 1921 with a degree of B.S. in chemical engineering. In 1922 the same institution conferred upon him the degree of M.S. in chemical engineering practice. Following this he went abroad, and in 1925 took his Ph.D. in chemistry at the University of Berlin. During the academic year 1925-26, Dr. Neitzker was assistant professor of chemistry at the University of Porto Rico. The following year he spent in research and development work as a research associate in applied chemistry at the Massachusetts Institute of Technology.

Dr. Berliner has taken three degrees from George Washington University. The first, in 1922, was a B.S. in chemical engineering. The second was in 1923, a M.S. in chemistry, and the third, a Ph.D., in 1926. Dr. Berliner was a member of the staff of the Bureau of Standards from 1918 to 1923, where he specialized in metallurgical work. For the last three years he has been serving at the Bureau of Chemistry. He is engaged, at present, in preparing a bibliography covering potash minerals and the extraction of their salts.

One of the problems which will be attacked immediately at New Brunswick is the separation of sylvite. In addition, work is to be done collecting chemical engineering data and physical chemical data necessary to an estimate of the cost of treatment processes. Attention, also, is to be given to the possibility of using polyhalite directly on the soil.

In connection with the study of cores from the Western beds, arrangements have been made with the State of New Jersey and Rutgers University for studies of greensands. The first step in that work will be to make a preliminary survey to determine the availability of sands. While it is known that large quantities of greensands exist in the state, a part of these sands form expensive real estate. No actual figures have been compiled as to the probable cost of large quantities of the material.

Another step to be taken in the greensands study will be a determination of the returns from byproducts. This involves cost studies of making sand-lime brick, the recovery of alumina, and the recovery of iron oxide. In that work, the New Brunswick station will have the co-operation of Dr. George Brown, one of the leading authorities on ceramic questions.

Justification for Increased Duty on Crude Magnesite Questioned

The President departed from the plain implication of the Commission's report in increasing the duty on crude magnesite. It is held to be quite apparent that there is no economic justification for that increase. In its report to the President, the Commission said, that "the costs of lump caustic magnesite, imported at New York from India, based on the cost of production in 1924 with transportation costs for 1926 under the maximum rate of duty permissible under Sec. 315 ($18.75 per short ton) is $40.85. This estimate indicates that with the maximum increase of duty on lump magnesite, such lump magnesite could be imported cheaper than it can be produced in New York from crude magnesite imported under the present rate of duty."

The magnesite duty hinges on transportation. The Tariff Commission found an increase warranted if transportation to New York is included in the cost. In his decision, the President ordered an increase of 50 per cent in the rate of duty on both crude and caustic calcined magnesite, thus making the duty on caustic $18.75 per ton and on crude $9.37½ per ton.

If it is assumed that the original duty of $6.25 on crude was correct, the duty on caustic obviously was low because the calcining ratio was $2.25, which would make the compensatory rate alone about two and one-quarter times the rate on crude. The rate was actually only $12.50, which is less than the compensatory rate alone should be. It did not compensate for the raw material, to say nothing of the protection to which the conversion process ordinarily would be entitled. It was the intention of the Tariff Commission that the rate be increased on caustic and not on crude. If the present duty on caustic is correct, it is much too high on crude and the relationship is as much out of adjustment as ever.

Issue has been taken with a statement in *Commerce Reports* that, because of the increase in duty, ordered by the President early in the year, imports of pig iron have practically ceased. At that time the President raised the rate from 75c. to $1.12½ per ton. It is pointed out, however, that the decrease in imports began almost a year before the President's proclamation and even prior to the release of the Tariff Commission's first public report. It is contended that the British coal strike was one cause for the decrease of our imports, and that the formation of the steel cartel in Europe was another, each of which is said to have had more influence on imports than the increase in duty. The opening of the Mystic furnace, in Boston, also had an effect, in that it ruined the New England market for imported iron.

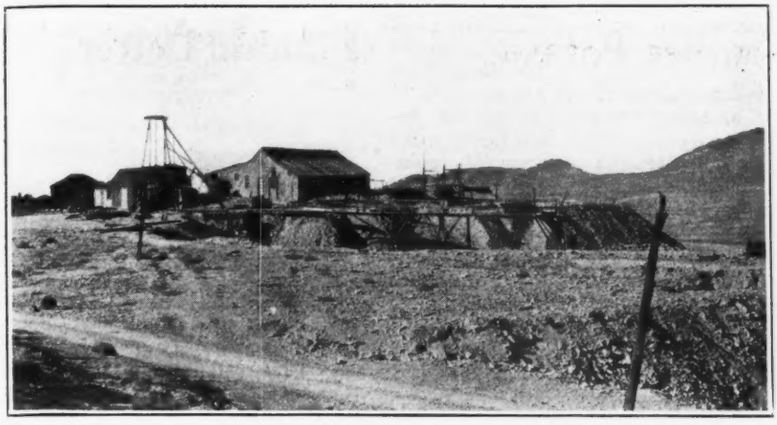
Application has been made to the Tariff Commission for an increase in the duty on aluminum foil. The present rate of duty is 35 per cent ad valorem. Since 1923 there has been a rapid increase in imports. The Tariff Commission will undertake an immediate investigation.

Tamarack & Custer Makes Important Strike

An important strike is reported at the Tamarack & Custer mine, in the Coeur d'Alene district, Idaho. For several years the company has been engaged in extensive development work on what is known as the 1,000 level. This level is at the same elevation as No. 7 tunnel, the portal of which is on Canyon Creek. Productive operations of the mine, however, are on the opposite side of the divide at a much higher elevation. Development on the 1,000 level has been disappointing, causing serious doubt regarding the continuation of ore to that increased depth. A raise has been extended 1,000 ft. up to the lowest level of the upper workings, and the strike now reported is on the 600 level. Since making the strike drifts have been extended east and west, and it is stated that in each face there is fully 8 ft. of good milling ore. The discovery has given a more cheering outlook for Tamarack.

New Guinea Gold Fields Rich, Says Warden

The warden of the New Guinea gold fields, J. D. McLean, who is visiting the Australian capital, Canberra, declares that tremendous mineral wealth is to be obtained from the fields. Gold to the value of $1,500,000 has already been obtained by alluvial miners, who have done very little work on their claims, and a gold-bearing reef, 30 ft. in width, running across Merri Creek, a tributary of Edie Creek, has been discovered. No underground work has yet been attempted, although developmental work is now in progress on one lease, the Day Dawn. Six airplanes are conveying passengers, stores, and gold between the gold fields and the seacoast. The entire absence of machinery makes any but the most primitive methods of mining impossible.



Main vertical shaft and surface buildings at the Tonopah Divide mine in the Divide district of Nevada

Recent Developments Encouraging in the Divide District

Scale of Operations and Production Gradually Increase— Gross Output for First Nine Months of 1927 Reaches Valuation of $150,000

RECENT developments in the Divide district, 5 miles from Tonopah, Nev., indicate that there is a good possibility of the camp increasing considerably in importance. More than sixty men are now working the various properties, and the scale of operations and production is gradually being increased. Gross production from the district during the first nine months of 1927 was around $150,000. Accurate figures on all operations are not available, but reported production from the two largest shippers, Tonopah Divide and Brougher, had a gross value of $120,733. Tonopah Divide shipped 3,837 tons of ore with an average value of $24.12 per ton and a gross value of $92,561. Brougher Divide shipped 1,297 tons of ore with an average value of $21.72 per ton and a gross value of $28,172. In addition to work on these two properties, leasers have been working on the Belcher Divide and have made several shipments. Several shipments have also been made from the Verdi Divide, where work is being conducted on company account.

Current Operations

In the Tonopah Divide, Jameson and Paxson, who have the entire mine under lease, are working on their own account in several places, with good results. They have subleased some blocks, which are being worked on a sort of partnership basis. Ore of excellent shipping grade is being mined from the old stopes between the 100 and 400 levels, and development is being conducted from different points.

On the Brougher Divide most of the production has come from above the 100 level and in the immediate vicinity of the Combination shaft, sunk by Thomas-Robillard and Sanger-Maupin interests on the end line between the two respective blocks. This shaft originally followed the ore on a steep incline, but was afterward straightened out when the larger hoist and headframe were installed. Shaft sinking below the 100 level has now been resumed with the intention of going to the 200 level before starting lateral work. The vein strikes from northwesterly to westerly and is nearly vertical. It is believed by some that this vein is the extension of the main Tonopah Divide fissure, but connecting evidence is lacking to establish this theory definitely. On the southeasterly extension, ore has recently been uncovered on the Butler block, adjoining the Thomas-Robillard block; high-grade values were exposed. Nothing but small surface work has so far been accomplished and no production made. On the northwest, work has failed to disclose the extension of the vein for certain, although small streaks containing good values have been found. To the northeast, several streaks have been worked to a depth of around 50 ft. and some small shipments have been made, but these streaks have never shown the strength of the vein followed by the Combination shaft, in which the ore reached a maximum width of 13 ft.

Verdi Divide Deepens Shaft

On the Verdi Divide ground an old incline shaft has been deepened to 200 ft. and lateral work and stoping are now being carried on around the 75 level. Deeper work from this shaft is impracticable without better hoisting facilities; it is the intention to conduct any deeper work from the main vertical shaft, which is situated about 350 ft. to the northeast of the incline shaft. About 300 tons of ore has been shipped from this property within the last few months.

On the Belcher Divide, surface work has disclosed high-grade gold and silver occurrences, and several shipments of ore have been made, with work still in progress. It is reported that development is to be started from the main vertical shaft in the near future.

Small surface work has been done on other properties in the district without really showing anything of commercial importance, except that in many operations small streaks of high-grade ore have been opened. Practically all commercial mineralization in the Divide district is in the form of hornsilver, although in places veins containing free gold have been worked; so far the veins have not proved to go deeper than 500 ft. below surface. Orebodies are large at times, as in the Tonopah Divide mine, where stopes 20 to 50 ft. wide are not uncommon; the possible future production from the district, therefore, may be very large.

The present activity in the Divide district dates from early last summer, when all open ground in favorable sections was re-located and prospectors were busy combing the surface for outcrops. At that time important discoveries were made on the Brougher Divide ground and in the Combination shaft near by.

Typical prospect hole; Mount Butler in background, directly behind which is Tonopah

Toronto Letter

By Our Special Correspondent for Northern Ontario

Noranda Mines May Build 500-Ton Concentrator at Horne Property

TORONTO, Nov. 12—It is understood that Noranda Mines is making plans to build a concentrator at the Horne mine, close to the smelter. The mill will have a capacity of 500 tons a day, and the plant should be in operation some time next spring. Noranda has at least one large orebody of concentrating ore, and it is altogether likely that it will handle ore from the Waite-Montgomery property, which is only a comparatively short distance from the Horne mine. The question of treating the Aldermac ores depends upon the freight rates that can be obtained for hauling mine ore to the mill. Diamond drilling at Noranda has been started on the high-grade surface copper showing which is generally called the "sewer" orebody, as it was located while digging a sewer trench. This has been opened up on the surface over a 40x70 ft. area. Delays in the delivery of some machinery parts continue to hold up the completion of the smelter, which is hardly likely to start work much before Dec. 1. Underground preparations for the extraction of ore have been completed and a start has been made on opening up the 400 and 500 levels. Long drives are being run parallel to and on each side of the north-south diabase dike; the drives are about 300 ft. from the dike. At 100-ft. intervals, horizontal diamond-drill holes will be driven. On account of the different classes of ore which it will be necessary to handle at the property, all ore will be hoisted to the surface in cars.

THE Temiskaming & Northern Ontario Railway is owned by the Ontario government and operated by a commission. For the fiscal year ended Oct. 31, the road paid to the government an operating surplus of $1,300,000. This is the first time in its history that the T. & N. O. has met its full interest charges. The steady growth of the railway is a barometer of business development throughout the North. Though the road has had deficits in the past, the government has not looked upon them as deficits, but as contributions to the advancement of a part of Ontario which is now coming into its own.

A progress report on the Abana Mines states that the first crosscut, No. 2, through the ore zone located 100 ft. southeast of the shaft is practically completed and that an orebody has been encountered showing a width of 9 ft. of zinc blende ore and 12 ft. of copper ore. Another deposit encountered showed 10 to 12 ft. of schisted rhyolite and 8 ft. of chalcopyrite. Diamond-drill cores indicate that 14 ft. of copper-zinc ore will also be cut by this crosscut. The drift from this crosscut has been extended 90 ft. further along the footwall of the orebody and preparations are being made to run another crosscut across the zone. If this proposed work shows the same ore as was encountered in the No. 2 crosscut, the orebody will then be developed for a length of 250 ft. at the 300 level, and engineers' estimates would then show a total value of developed ore of close to $6,000,000.

The quarterly report of the Mining Corporation, operating in Cobalt and South Lorrain, shows a total production of 490,000 oz of silver for the period ended Sept. 30. The average grade of the ore sent to the mill was 25½ oz. to the ton. During the period, work on the Cobalt properties continued to show new ore and the extension of old veins. At the South Lorrain property work was largely confined to drifting and crosscutting on the new 1,425 level. Drifting has disclosed a short shoot of high-grade ore and a 50-ft. shoot of mill ore, and, as the veins on this level are very strong, they justify the hope that they will be important producers after further development. Plans have been made to sink a winze to a new level, which will be entirely in Keewatin. The new shaft in Cobalt, on the east side of Cross Lake, has been completed to 400 ft., and exploration will be confined to the sedimentary formation. It is understood that on the adjoining property M. J. O'Brien interests have encountered high-grade ore at the bottom of their shaft.

The Mining Corporation also operates the Lorrain Trout Lake property, which, for the quarter ended Sept 30, produced 109,000 oz. of silver from the 750 level and the winze from the No. 2 shaft. An electric hoist has now been installed, and sinking is being continued to the 850 level.

N. A. Timmins has acquired a large interest in the Sherritt-Gordon property in northern Manitoba. It is stated that Mr. Timmins was anxious to secure an option on the balance of the treasury stock at $2 a share. The company is capitalized at 6,000,000 shares, with 2,500,000 in the treasury. Substantial mining interests, including the Bunker Hill & Sullivan, are interested in the property.

East of Red Lake, in the Manitoba section, Central Manitoba Mines has produced it first gold brick. The mill is treating about 150 tons a day. At the San Antonio property, in the same neighborhood, two shafts are being sunk, and developments are of an encouraging nature.

Official announcement is made that at the Howey property, in the Red Lake district, crosscuts on the four levels have penetrated the orebody. The complete widths have not been determined in all the crosscuts, but on the first level a width of 20 ft. has been opened. Crosscutting is still continuing on the 375 and 500 levels of the property.

London Letter

BY W. A. DOMAN
Special Correspondent

More Nitrate Properties Reopened—Increase in Export Duty Feared

LONDON, Nov. 8—The nitrate position has become interesting, and numerous oficinas are being reopened. The Salar del Carmen announces that it will resume the manufacture of nitrate toward the end of the present month. This brings up to ten the number of companies to reopen—the Alianza, Liverpool, Angela, Salar del Carmen, New Tamarugal, Rosario, New Paccha, Pan de Azucar, Lautaro, and Tarapaca. These companies work at costs ranging from 13s. 6d. to 15s. 6d. per metric quintal. Although manufacturers of synthetic fertilizers are busy, Chilean nitrate is in keen demand. The Lautaro Nitrate Company makes the announcement that production from January to October was 1,901,000 metric quintals; exports for the same period were 3,882,000 metric quintals; sales, June 16 to Dec. 31, were 3,740,000 metric quintals; sales for 1928 delivery, 1,478,000 metric quintals; forward sales, balance outstanding for delivery up to Dec. 31, 1927, 1,359,000 metric quintals, and stocks at Oct. 31, 900,000 metric quintals. The trouble with the producers seems to be that the Chilean government, seeing the improvement in the industry, may raise the export duty, instead of reducing it.

NOTHING effective has yet to be recorded in connection with the proposal to stabilize the price of tin. Conversations are still taking place, without, however, making much progress. It would almost appear that some of the leading spirits in the scheme are themselves none too confident of success. Some of their supporters in the press are wavering, and the latest suggestion is to circularize the shareholders in tin-mining companies. They would naturally welcome tin at anything like £300 per ton, but share interests are not the only ones to be considered.

A traveler in Rhodesia who is now back in this country does not seem to be any too hopeful of the immediate prospects of copper in the northern province, and says that much work has to be done, and large amounts of capital have to be raised, before anything like a respectable contribution to the copper supply can be expected. His visit to Bwana M'Kubwa, it is said, led him to think that the ore reserve position must be greatly improved before anything like the success expected can be achieved.

Some of the mining engineers who attended the Empire Congress in Canada have returned to England, and propaganda is already being made to bring various properties to the attention of the investing public.

Mexico City Letter

By W. L. Vail
Special Correspondent

Mexican Press Continues to Praise the Work of New American Ambassador

Mexico City, Nov. 9—The Mexican press continues to speak kindly and even enthusiastically of the work of the new American Ambassador, Mr. Morrow. Although, quite naturally, nothing is given out officially as to the progress made, the energetic manner with which the Ambassador has approached the problem, and the unquestioned cordiality with which his efforts have been met by the Mexican President and other officials, may be taken as good omens.

Because of the wide divergence in points of view regarding some questions—for example: The oil discussion, agrarian legislation, the so-called anti-foreign laws, and the fact that even American interests are not united in their point of view, calls for some pessimism on the part of older American residents, who have seen ambassadors arrive with brass bands and leave by slow freight. It is, after all, a difficult matter to dovetail modern revolutionary ideas with the conservative traditions of ownership and sacredness of vested interests, which have obtained in the United States since it became a nation.

THE Mexican government hopes that Mr. Morrow may be able to see through its specs, understand its aspirations, and comprehend that Mexico's problems are in many instances distinct from those which confront the American people. Above everything else, the government hopes that he will respect Mexico's sovereignty in the sense that the the Mexicans interpret the word.

November finds mining throughout the republic, in the main, rather slow. Though statistics thus far during the year show an equal production, for most minerals, with the corresponding period of last year, the figures do not give an exact picture of the situation, because they do not show the heavy draft, during the year, on large reserve orebodies. This will be apparent later. Large concerns are continuing with the policy of readjustment and are trying to pare expenses down to the quick. San Rafael of Pachuca has let out some 250 men and Mexican Mines of El Oro over 300 men.

The San Rafael company recently clashed with the Department of Commerce and Labor over the proposed laying off of men at the Soledad mine for the purpose of making necessary repairs. Vigorous objections were made to the attempt by labor organizations, which desire to force the company to state a minimum time and maximum time necessary for the repairs, and which also wish the company to enter into an agreement to re-employ the same workmen once the repairs are completed.

Limiting the production of lead, zinc, and copper is still a general policy for the purpose of reducing stocks further, but most of the larger properties are increasing their development and exploration work. A general opinion seems to prevail that the decline in prices has about reached the bottom. Recent action of the Treasury officials shows a disposition on their part to take pot luck on prices with the mine operators, as well as to be lenient in the matter of import taxes on articles required for mine work. Several of the state governments are making special efforts to nurse the industry by applying what amounts to artificial respiration.

The International Ore & Smelting Company, of Taxco, Guerrero, has temporarily closed down mill work, but is continuing development work. The Jesus property, in the same district, owned by Abram Bloom, is increasing development and expects to put in a milling plant not later than January, 1928. There has been some bandit activity in the region, but it has not affected operations.

The Peñoles interests have suspended work at the Veta Grande unit, State of Zacatecas, on account of the low values of the ores and high cost of operation. It is stated that the same company has closed its Cerralvo unit, Nuevo Leon, for the same reasons. The government authorities made an investigation in both instances and decided that the closing down was justifiable.

The Department of Commerce, Industry and Labor has issued orders that all doctors of medicine practising under company auspices in mining camps throughout the republic must hereafter register their certificates with the National University in Mexico City before receiving any patients.

The Southwestern Exploration Company, of Los Angeles, owners of the May, Coyote, Cabra, and Cabrita mines, in the Santa Barbara district, State of Chihuahua, has completed a 2,000-ft. tunnel on its properties, which was begun about two years ago. According to L. C. Penhoel, president of the company, the work makes available for treatment a tonnage of ores valued at over $2,000,000. The plan of development, as adopted by the board of directors, calls for the installation of the latest type of electrical equipment for the handling of a minimum of 500 tons of ore daily. The Santa Barbara district is a large producer of silver and lead, and the American Smelting & Refining Company, which is operating there, is reported to be milling about 40,000 tons of ore monthly.

Compañia Minera Beneficiadora del Norte, operating in the State of Zacatecas, has suspended operations at La Fe, with the permission of the mining department. The company has found it impossible to continue work at a profit, owing to the present low price of metals and the high transportation rates which are now in force.

Johannesburg Letter

By John Watson
Special Correspondent

September Crushings for Principal Rand Gold Mines Published

Johannesburg, Oct. 11.—The following results of crushings, for September, at eighteen leading Rand gold mines have recently been published. The mines are arranged in order of profits earned:

	Tons Crushed	Value or Revenue £	Costs per Ton s.	d.	Estimated Profit £
Government Areas	200,000	384,293	16	2.3	225,006
New Modder	132,000	311,578	19	1.8	185,187
Crown Mines	206,000	298,298	20	9.6	84,050
Modder Deep	44,200	99,641	15	4.0	65,745
Springs	66,500	128,040	20	9.2	59,004
New State Areas	73,000	129,012	20	8.5	54,125
Brakpan	76,200	130,512	20	9.3	51,352
Van Ryn Deep	62,000	107,576	18	8.6	50,395
Geduld	81,500	114,759	16	6.0	47,523
Modder B	66,500	107,854	18	6.0	46,349
Sub Nigel	19,400	.....	40	11.6	43,742
West Springs	49,200	75,042	19	7.0	26,878
Randfontein	85,000	193,529	18	9.5	22,495
Langlaagte Estate	81,000	100,148	19	9.3	21,075
Robinson Deep	71,000	.....	20	2.6	18,270
Con. Main Reef	59,100	91,290	24	9.5	18,042
Modder East	58,000	77,465	21	2.3	16,013
Nourse Mines	57,000	77,217	23	6.4	10,147

Lydenburg Platinum Areas, Ltd., reports that during September, on the company's Maandagsboek section, 3,000 tons of ore was milled, yielding 567 oz. of platinum-group metals.

A COMPANY named Komati United Mines, Ltd., was floated about two years ago to work the old Sheba Queen and certain adjoining properties, near Steynsdorp, in the eastern Transvaal. A Durban company, the New Morro Velho Gold Mines Company, Ltd., has now acquired the assets of the Komati Mines and is erecting a cyanide plant at the property to treat sand and slime tailings.

At the Empire Chambers of Commerce Congress, which concluded its sittings at Cape Town on Oct. 7, a resolution was unanimously carried, urging that the Sunday following the second Saturday in April be established as a fixed date for Easter. The commercial interests throughout the Empire are agreed on this subject, and the desired change is regarded as a business necessity.

The Benguella Railway, now nearing the Congo frontier, owes its origin largely to Robert Williams. It was under a mandate from Cecil Rhodes that George Grey, Robert Williams, and others located the copper fields of Katanga and the Kansanchi mine. According to the latest report of the Union Minière, the proved reserves of copper, amounting to 5,000,000 tons, again showed an increase over the figures of the previous year. The new large reverberatory furnaces at Panda are expected to be at work before the end of this year. They will be capable of yielding annually 30,000 to 40,000 tons of copper bars.

Societies, Addresses, Reports

American Mining Congress Convenes at Washington Next Week

THE THIRTIETH annual convention of the American Mining Congress will be held at the Mayflower Hotel, in Washington, D. C., on Dec. 1, 2, and 3. Conferences with officials of government bureaus handling mining matters will be held by delegates to the convention; this innovation in the convention program is designed to enable mining men to obtain a clearer view of the work of the government with relation to the mining industries. The conferences will be known as "hours" and will be held by the Bureau of Mines, Geological Survey, and Internal Revenue Bureau. They will be scheduled as special features of the daily sessions.

Scott Turner, director of the Bureau of Mines, and chiefs of divisions of his Bureau will conduct a Bureau of Mines "hour" at the afternoon session on Dec. 1, when the activities of that federal agency in the mining field will be discussed. At the morning session on Dec. 3 officials of the Internal Revenue Bureau will conduct an "hour," during which discussion will be held on general and administrative problems involved in valuing mines and auditing tax returns of the mining industry. S. P. Hatchett, chief of the engineering division of the bureau, will speak on mine valuations, and W. T. Cardwell, of the audit division, on questions affecting the auditing of tax returns. George Otis Smith, director of the Geological Survey, will hold the "hour" for that government service at the afternoon session on Dec. 3, during which he and the chiefs of the various divisions of the Survey will describe their work in behalf of the mining industries. During these conferences the delegates will be afforded opportunity to discuss informally the activities of these government agencies in relation to their mining enterprises.

Nationally known speakers will appear on the convention program. The following addresses will be made at the convention: "Hydro Power—A Natural Resource," by Congressman L. W. Douglas, of Arizona; "Growing Tendency Toward Centralization of Government," by Senator J. E. Watson, of Indiana; "Government Public Land Policy," by Hubert Work, Secretary of the Interior.

Robert E. Tally, of the United Verde Copper Company, will preside over the afternoon session Dec. 2, when addresses will be made by H. N. Taylor, United States Distributing Corporation of New York, on the relation of the anti-trust law to the coal industry; A. Scott Thompson, of Miami, Okla., on "The Zinc Industry and the Sherman Law"; Robert W. Stewart, of the Standard Oil Company of Indiana, "The Sherman Law Applied to Oil"; Gilbert H. Montague, of New York, on "Lawful Combinations in Industry"; P. P. Campbell, former Representative from Kansas, will discuss "Federal Control—the Bugaboo of Industry"; and W. J. Donovan, assistant to the Attorney General, will speak on "Is Modification of the Sherman Anti-Trust Law in the Public Interest?"

Nicholas Longworth, Speaker of the National House of Representatives, will make the principal address at the banquet on Dec. 2, at which G. A. O'Reilly, vice-president of the American Exchange Irving Trust Company, of New York, will be toastmaster. Musical features will be rendered by members of Roxy's Radio Gang, and Strickland Gillilan, of Baltimore, nationally known humorist, will also entertain. The speaking and musical features of the banquet on the evening of Dec. 2 will be broadcast by radio from 8:30 to 10 p.m. by station WMAL of Washington, D. C.

Progress of the mineral industry of New Mexico will be reviewed by Dr. E. H. Wells, president of the New Mexico School of Mines, of Socorro, and the application of the Sherman Law to the lead and zinc industry will be discussed by leaders in that field. A. G. Mackenzie, of Salt Lake City, secretary of the Utah Chapter of the American Mining Congress, will speak on Western mineral development.

Further details of the program of the thirtieth annual convention of the American Mining Congress were announced in the Nov. 5 and Nov. 12 issues of *Engineering and Mining Journal*. An account of the convention will appear in the Dec. 10 issue.

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San Francisco Section Holds Meeting

At the regular meeting of the San Francisco Section of the Institute on Nov. 8, J. Seaman, manager of the Selby plant, American Smelting & Refining Company, discussed details of smelter contracts in the marketing of lead, gold, and silver ores. He pointed out the importance of tonnage in relation to low smelting costs and low smelting rates, and said that smelting charges for lead ores are now lower than at any other time in the history of the industry. The influence of competition upon improved practice in smelting was discussed. Donald P. Miller, assistant commercial attaché of the Department of Commerce, spoke upon commercial conditions in Germany and pointed out the interesting fact that American capital is becoming an important factor in German industry. A general discussion upon marketing ores and minerals closed the meeting.

"How Jimmy Won the Game"

In connection with the campaign to reduce the number of accidents to children from playing with blasting caps, the Institute of Makers of Explosives has just prepared a one-reel motion picture film entiled "How Jimmy Won the Game." This film shows forcefully and in a way which can be understood by the children the dangers of a blasting cap as a plaything. It is based on a story of a baseball game in a small town. It is proposed to offer this film to schools and safety meetings. Copies of it can be had by addressing C. Stewart Comeaux, secretary, Institute of Makers of Explosives, 103 Park Ave., New York City.

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Engineering Council Sponsors Public Works Bill

Another attempt toward rationalization of government business conduct will be made at the forthcoming session of Congress, when a bill, sponsored by the American Engineering Council, will be introduced, proposing the transfer of certain agencies of the government from the departments in which they now are to the Department of the Interior, so that a unification of planning, direction, and control of public works may be realized. Under the provisions of the bill a major Division of Public Works, directed by an Assistant Secretary of Public Works, would be created in the Department of the Interior.

The question of reorganizing the public works functions of the government, though nearly half a century old, has been pressed continuously since April, 1919, when there met in Chicago a convention of delegates from engineering, architectural, manufacturing, and business men's organizations representing seventy-four societies and 105,000 members. A permanent federation was organized which was originally known as Engineers, Architects, and Constructors Conference on National Public Works. The organization's scope soon broadened, and the name was changed to the National Public Works Department Association. Committees of the association were formed in many cities, and a nation-wide campaign was conducted to bring about appropriate legislation. A New York City committee, composed of leading engineers, architects, financiers, business men, and civic leaders, was headed by Adolph Lewisohn, as chairman, with J. Parke Channing, who contributed largely to the financial support of the association, as vice-chairman. In 1920 the Federated American Engineering Societies, now known as the American Engineering Council, were organized in Washington under the presidency of Herbert Hoover, and assumed direction of the public works activities of the engineering profession. The American Engineering Council's Committee on Government Reorganization is now in charge of the public works activity.

Recent Technical Publications

METHODS OF THE CHEMISTS OF THE UNITED STATES STEEL CORPORATION FOR THE SAMPLING AND ANALYSIS OF GASES. Published and sold by Carnegie Steel Co., Bureau of Instruction, Pittsburgh, Pa. Pp. 187; 25 illustrations, 6 x 9 in., Paper. Price $2.

THE results of more than two years' work of a special committee composed of chief chemists of the subsidiary companies of the United States Steel Corporation are recorded in this book, which is divided into four parts dealing with different phases of gas work as follows:

Part I, occupying the first forty-four pages, is devoted to apparatus, reagents, and absorbing solutions. In it are found a brief discussion of the sources of error in gas analysis, a detailed description of the construction, operation, and care of the new apparatus adopted, and a section on the preparation and properties of reagents and solutions used in gas analysis. The apparatus is of the Orsat type, but it is distinguished by a number of new and original features, chief among which are the absorption pipettes. These pipettes are of the bubbling type, but instead of a three-way stopcock required on the older forms, they contain a glass float valve which automatically opens and closes as the gas is drawn out or forced into them. This equipment permits of the use of different methods of analysis and makes it possible to analyze with accuracy any gas met with in industrial work.

Under the heading of absorbing solutions and reagents, practically all the substances heretofore used for gas analysis are discussed, and two new absorbents of exceptional merit, one for carbon monoxide and the other for oxygen, are described.

Part II, covering 60 pages, deals with the sampling and the analysis of industrial gases with the apparatus described in Part I. In this section a special portable apparatus for the analysis of flue and chimney gases is described.

In the case of all the gases treated of in this part of the book, the methods of sampling and analysis are preceded by a brief discussion giving the composition of the gas and citing other points which may enable the operator to select the methods of sampling and analysis best suited to his conditions.

Part III includes 33 pages and deals with miscellaneous determinations that cannot be made with the regular gas analysis apparatus. In this section are described methods for the determination of hydrogen sulphide, organic sulphur, total sulphur, acetylene, hydrocyanic acid and cyanogen, light oil or benzine, tar and mineral solids, naphthalene, moisture, and dust in gases. Methods for determining the heating value and the specific gravity of gases are also included in this section.

Part IV, comprising the last 47 pages, deals with the measurement of gases, the calculation of gas volumes under different conditions, and a number of problems presented by the combustion of gases. An appendix, composed of twelve tables, gives physical qualities of gases, conversion factors and related information. These tables supply the data, other than that obtained from the analysis or necessary measurements, for making all the calculations usually required in gas work.

THE BOOK OF OPPORTUNITIES. By Rutherford H. Platt, G. P. Putnam & Sons, New York. Price $3.

AT A TIME when many mining engineers are out of employment, a serious work setting forth the opportunities in other occupations would be welcome. It cannot be said that Mr. Platt's volume entirely fulfils the needs of the present, with regard to the man seeking a job, the author having seen fit to treat the subject in a flippant, even at times a frankly comic, manner, as witness the following extract under the caption "Shot Firer": "Rushes out of mine after other men have fled. Lights fuses on explosives put in place by coal miners or prepares them himself. Hurried exit is unnecessary with most modern method: shots are fired by electricity: then shot firer must understand batteries, wiring, be electrician." A careful reading, however, will reveal useful sources of information and will provide leads to be followed up by those in search of a change of occupation. In doing so readers will encounter much that will certainly amuse them even if it fails to instruct. The following is a quotation taken at random:

"Cattle Knockers: Sneaks up on cattle from board above knocking pen, strikes them on forehead with four-pound hammer, pulls rope attached to hoisting machinery, thereby dumping dazed cattle to killing floor. Strong, agile, accurate in judging distance." E. G. LAWFORD.

PRELIMINARY REPORT ON THE LIMESTONES OF QUEBEC AND ONTARIO. By M. F. Goudge.

This book, which is published by the Canadian Department of Mines, Ottawa, price 25 cents, contains a very comprehensive survey of the limestone formation of the Provinces of Quebec and Ontario. The different stratigraphical divisions of the main deposit are described and some idea is given of their distribution. The pamphlet is very beautifully illustrated with numerous photographs and contains a number of snaps, analyses of limestone and other useful data.

BULLETIN OF THE NATIONAL RESEARCH COUNCIL—By Clarence J. West and Errye L. Risher. Published by the National Research Council of the National Academy of Sciences, Washington, D. C. Third Edition.

This pamphlet is a complete index of research laboratories operating in the United States, with the names of the research staff and an outline of the work conducted in the laboratory.

ECONOMIC GEOLOGY—The November issue of *Economic Geology* (price 75c.; Lancaster, Pa.) contains the following papers, among others: "Applied Geophysical Methods in America," pp. 20, by D. C. Barton; and "Classification of Magmatic Ore Deposits," pp. 8, by A. N. Zavaritsky.

PATENTS

METALLURGY OF ZINC—No. 1,647,279. Nov. 1, 1927. C. A. H. deSaulles, Westbury, N. Y., assignor to American Smelting & Refining Co., New York.

Zinc-containing ores are mixed with a reducing material and charged in a thin sloping layer, into a reverberatory furnace.

SMELTING FURNACE—No. 1,647,608. Nov. 1, 1927. F. W. Corsalli, Berlin, Germany.

A reverberatory smelting furnace with separate slag chamber heated by waste heat and with provision also for heating the incoming furnace air.

DRILL STEEL—No. 1,647,628. Nov. 1, 1927. C. A. Hultquist, Los Angeles, Calif.

A drill-steel retaining device.

FLOTATION—No. 1,647,793. Nov. 1, 1927. B. L. George, Salt Lake City, Utah.

A process for making a flotation agent, consisting of heating an oil containing a tar acid and adding thereto sodium hydroxide and sulphur.

DRY CONCENTRATOR — Nos. 1,648,285-6. Nov. 8, 1927. A. H. Stebbins, Los Angeles, Calif.

Designs for a concentrating table applicable to dry pulps.

GOLD SEPARATOR — No. 1,648,333. Nov. 8, 1927. R. S. Baldwin and W. A. Johnston, Spokane, Wash.

Combination of concentrating table and settling tanks for recovering gold.

ORE SEPARATOR—No. 1,648,478. Nov. 8, 1927. D. H. Herbert, Spokane, Wash.

Combination of a rotary screen, shaking table, and magnetic separator.

SHAKING SCREEN — No. 1,648,543. Nov. 8, 1927. Charles Dahlberg, Anaconda, Mont.

Design for a shaking screen.

CRUSHER — No. 1,648,625. Nov. 8, 1927. H. J. Shelton, St. Louis, Mo.

A crusher and pulverizer of the swing-hammer type.

ORE TREATMENT — Nos. 1,648,760-1. Nov. 8, 1927. Ferdinand Dietzsch, Kingston-on-Thames, England.

Processes for treating oxidized or roasted copper, silver, or gold ores with a strong solution of a metallic chloride, containing sulphurous acid.

Personal Notes

E. G. LAWFORD, mining engineer, of London, who was in New York recently, is at Rio Tinto, Spain.

JAMES DOUGLAS sailed from Cherbourg on Nov. 2, 1927, for New York on his way home to Arizona.

PAUL SELBY, manager of the Ferreira Deep, has returned to Johannesburg after a visit to the Eastern Transvaal.

J. E. HAMMELL, president of the Howey Gold Mines, of Red Lake, has returned from the property to Toronto.

H. M. KINGSBURY has returned from an extended visit to mines in South Africa and Northern and Southern Rhodesia.

S. H. PEARCE, of the Crown Mines, with Mrs. Pearce, has returned to Cape Town after spending a six months' holiday in Europe.

ERLE V. DAVELER, of Butte, Mont., general manager of the Butte & Superior Mining Company, is in San Francisco on a short vacation.

D. D. MUIR, JR., manager of the U. S. Smelting, Refining & Mining Company, recently inspected gold dredging operations of the company at Fairbanks, Alaska.

R. B. LAMB, mining engineer, of Toronto, Canada, is inspecting the properties of the Kootenay-Florence Mining Company, in British Columbia.

P. A. HAINES, general superintendent, St. Joseph Lead Company, with headquarters at Rivermines, Mo., is visiting various mining properties in Arizona.

E. DE HAUTPICK, geologist, has arrived in Melbourne from London, having with him a new geophysical apparatus for exploratory work in Australia.

LOUIS HIRSHLER, of the Hirshler Metals Company, of New York, sailed on Nov. 22 for Europe. He expects to return in time to celebrate the holidays at home.

F. W. BRADLEY, of San Francisco, and Mrs. Bradley, accompanied by their two sons, will make a visit to Sudbury and a tour of other parts of Canada in December.

E. E. CAMPBELL, formerly general superintendent of the United Verde Extension, recently made an extended inspection trip of the Quebec gold and gold-copper districts.

The Hon. ADELARD TURGEON, Speaker of the Quebec Legislature, and a leading financier, has been elected a director of the Jackson-Mamion Mines, Ltd., of the Patricia district of northern Ontario.

E. V. NEELAND, assistant manager of the Nipissing Mines, Ltd., is visiting the Kozack property of the company, in the Lochlash-Goudreau area of northern Ontario, inspecting exploration work.

J. A. ADAIR has been engaged as field manager of the Riada Rouyn Mines, Ltd., recently organized to operate a group of claims at Dufresnoy Lake, in the Rouyn area of northern Quebec.

DOUGLAS WRIGHT, geologist, has gone to the Red Lake area of northern Ontario to examine the property of the McNeeley Holdings Company, about two miles northeast of the Howey gold mine.

WILLIAM P. RULEATT, assistant professor of geology at the Colorado School of Mines, has returned to Golden after spending three months in Canada with the Canadian Exploration Company.

W. W. RAYMOND, a graduate of McGill University, has been placed in charge of underground operations, and E. S. PETTIS has been appointed mill superintendent, of the Central Manitoba Mines, Ltd.

CHARLES H. GOODSELL has been elected president of the Northwest Mining Association. Mr. Goodsell is general manager of the Montana-Idaho Mines Corporation, operating near Helena, Mont.

ROBERT E. TALLEY, F. W. MACLENNAN, T. H. O'BRIEN, MICHAEL CURLEY, and JOHN MCIVER are among the Arizona mining men who will attend the annual convention of the American Mining Congress in Washington on Dec. 1, 2, and 3.

A. G. McGregor, with a fine eland buck killed in Northern Rhodesia

A. G. MCGREGOR, who is superintending the erection of a concentrator in Northern Rhodesia, finds time for a bit of shooting. In a postcard to a friend in Arizona Mr. McGregor says that he "likes the country very much." The photo on the card, reproduced above, certainly suggests attractive possibilities "between shifts." Mr. McGregor was expected in Bisbee, Ariz., about Nov. 15, to arrange for the removal of his office to London, England.

HENRY C. CARLISLE, of San Francisco, has just returned from a trip to Nayarite, Mexico, where he and his companion had the experience of being taken by bandits, but were soon released without injury.

E. T. CORKILL has been appointed consulting engineer on the Brett-Trethewey Company, recently organized to operate a property in the Barnet Township, in the Kirkland Lake district of northern Ontario.

A. W. BEAM, president, and V. W. HAUSSERMANN, vice-president of the Benguet Consolidated Mining Company, arrived recently in San Francisco from an inspection of the company's properties in the Philippines.

Dr. PHILLIP HOCHSCHILD, of W. Hochschild & Co., Valparaiso, Chile, recently arrived in New York from South America and sailed on Nov. 16 on the "Aquitania," en route for London and the Continent.

WELTON J. CROOK, of Stanford University, has just returned from a European trip in the course of which he visited Sweden, Denmark, Germany, Austria, and France in the quest of recent progress in metallurgy.

WALTER DOUGLAS, president of Phelps Dodge Corporation, is visiting the corporation's mines and smelters in the Southwest. Mr. Douglas was recently elected vice-president of the newly formed Copper Institute.

RAYMOND BROOKS, who until recently has been general manager for the Rhodesian Congo Border Concession, in charge of the company's exploration in the copper area of central Africa, has opened an office at 27 Beaver St., New York City, as consulting engineer.

H. G. S. ANDERSON, an alumnus of the school, spoke before the Missouri Mining and Metallurgical Society of the Missouri School of Mines on Nov. 3, 1927, on "The Kuji Sponge Iron Plant," which he recently erected in Japan.

HOWARD R. DRULLARD, of San Francisco, district manager of the Denver Rock Drill Manufacturing Company, has been transferred to Tokio, Japan, and left on Nov. 11 for his new position. His address will be Central Postoffice, Box F-23, Tokio, Japan.

H. W. HARDINGE, president of the Hardinge Company, of York, Pa., has been awarded the Edward Longstreth Medal by the Franklin Institute for his invention of a rotary air classifier, known as the Hardinge reverse-current air classifier.

L. V. EMANUEL, superintendent of the River Smelting & Refining Company, at Florence, Colo., for the last twelve years, has moved to 515 East 11th Ave., Denver, Colo. The River Smelting & Refining Company has discontinued operations.

H. WHITTINGHAM, formerly manager of the Keeley silver mine, Cobalt, and for the last three and one-half years general manager of the Huronian Belt Company, Toronto, has resigned, his retirement to take effect Nov. 30. His

postal address is 72 Crescent Road, Toronto.

ERNEST W. ELLIS, assistant professor of mining and metallurgy at the Idaho School of Mines, has returned from Paris, where he attended the annual convention of the American Legion. Mr. Ellis, former commander of the legionaires in Idaho, was chairman of the Idaho delegation to France.

F. W. DRAPER, chief engineer of the Russo-Asiatic Consolidated, Ltd., of London, passed through New York this week on his way to Australia in connection with plans for extensive development of the Mount Isa silver-lead properties in Northwestern Queensland, in which the Russo-Asiatic is largely interested.

J. M. BADDERLEY, Minister for Mines in New South Wales, after a seven months' tour of the Continent, the United States, and Canada, has returned to Australia, where he furnished reports to the New South Wales government on modern methods of economizing coal, especially in connection with the commercial utilization of its byproducts.

J. MASON JONES, an English geologist, has arrived in Australia to undertake the leadership of an expedition, organized by the Australian Commonwealth government, for the purpose of further testing the possibilities of oil production in New Guinea and Papua. Mr. Jones will be joined by Mr. MCPHERSON, a New Zealand geologist, and a party of Australian geologists and surveyors.

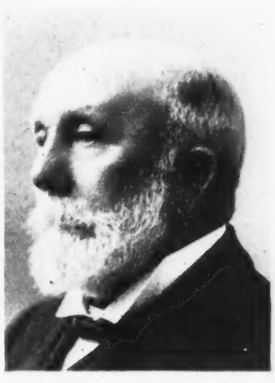
JOHN C. RYAN has been named assistant to the general manager of the Montana Power Company, with headquarters at Butte. FRANK M. KERR is vice-president and general manager. Mr. Ryan is a director of the company. He is a son of John D. Ryan, chairman of the board of directors of the Anaconda Copper Mining Company, and a graduate of the Michigan College of Mining and Technology at Houghton.

W. H. STRONGE, mining engineer, after an absence of 25 years, most of which has been spent in Central Africa, has returned to Australia, on his way to New Guinea, where he is to join a prospecting party working under the direction of the Australian Commonwealth government. Mr. Stronge, who graduated at the Ballaratt School of Mines, Victoria, was on active service in the Boer War with the Victorian mounted rifles, and after demobolization in Australia he returned to South Africa.

WILLIAM KELLY, of Iron Mountain, Mich., was re-elected chairman of the board of control of the Michigan College of Mining and Technology—Michigan Tech—at a recent meeting. A. E. PETERMANN, of Calumet, and Dr. C. T. FERRIES, of Houghton, recently appointed to the board by Governor Green, attended. Other members are E. W. WALKER, Houghton; A. MATHEWS, Verona; and F. M. PRESCOTT, Menominee. Mr. Kelly is dean of the board, having been a member for thirty years and chairman for many years.

H. U. MAXFIELD was elected president; E. C. HUTCHINSON, first vice-president; ARTHUR B. FOOTE, second vice-president; GEORGE W. STARR, third vice-president; P. C. KNAPP, W. P. HENRY, E. S. MCCURDY, E. HIGGINS, and L. A. BELL were elected directors, and G. CHESTER BROWN was chosen as secretary-treasurer, of the California Metal and Mineral Producers' Association at a meeting held recently. The association maintains an office in the Thomas Clunie Building, 519 California St., San Francisco.

WILLIAM DAVIES, among the last of the successful pioneers of the mining industry of Queensland, Australia, died recently at Brisbane at the age of 79. Mr. Davies, who was born in Wales, went to Australia when he was 18 years old. In Victoria he followed for a time various occupations, until the lure of gold following the news of the discovery in 1867 of Gympie,



WILLIAM DAVIES

which became one of Queensland's most famous gold fields, attracted him to that part of Australia. At Gympie he started as a working miner, and one of his first ventures there was working a mine with a mate on the Lady Mary line of reef. Mr. Davies's first venture resulted profitably; he continued in the mining occupation, and afterwards became one of the most successful of the big mining investors on the Gympie field. By the time a big mining boom occurred in the 'eighties Mr. Davies was a wealthy man, but continued to put a good share of his profits into both new and old ventures. More than 20 years ago he built a fine home on one of the heights of Brisbane's suburbs, where he lived, with his family, till his death. Brisbane is 100 miles from Gympie, but Mr. Davies made periodical visits to the field to give his personal attention to the mines, of which he had the management and control, until they eventually ceased to become profitable and were closed. Mr. Davies, besides being actively engaged in mining concerns, was also prominent in public affairs. He was of a quiet and most genial disposition, and had a wide circle of friends both in Gympie and at Brisbane.

OBITUARY

Captain JAMES H. WILSON, 68, formerly chief mining captain for many years at the Hecla branch of Calumet & Hecla Consolidated at Calumet, Mich., died recently in Detroit.

SAM WILSON, a Broken Hill pioneer, died recently in Australia. He was a brother of the late W. R. Wilson, and shared with him in many early Barrier mining adventures. He was one of the first managers of the great Broken Hill Proprietary mine. Mr. Wilson was well known and highly respected by many of the older men on the Barrier.

CHARLES R. HOSMER, a prominent Canadian financier, died at Montreal on Nov. 14 at the age of 77. The Consolidated Mining & Smelting Company of Canada, of which he was a director, was to a great degree built up by Mr. Hosmer. He was interested in Rossland and West Kootenay in the early days of these camps, and helped to unite a number of the mines and one of the smelters in Consolidated Mining & Smelting.

CYRIL H. JAMES, well known in the Southwest as a mining engineer, died on Nov. 1. Mr. James was a great-grandson of the celebrated poet, Wordsworth. His mother was Mrs. Maude Wordsworth James, a brilliant writer of verse. He was a relative of Admiral Earl Beattie. A younger brother, Col. Tristram James, who received the D.S.O. in the World War, survives him and is living in England.

PERCY REID, Gold Commissioner of the Yukon Territory, died at Toronto on Nov. 13, at the age of 53. Mr. Reid was born at Summerside, P.E.I., and soon after his graduation at Prince of Wales College, Charlottetown, he joined the Klondyke gold rush of '98. A year later he entered the government service and held numerous positions, including that of mining recorder at Carcross, Y. T. Three years ago he was appointed Gold Commissioner for the Yukon. He leaves two sons.

GEORGE LANDSELL, gold-mining pioneer in Australia, whose name is intimately associated with the historical Bendigo gold field, died recently in that country. Mr. Landsell first landed in Australia at Adelaide in the fifties, but remained in that part of the country only three months, when the news about wealth to be picked up on the Victorian diggings gave him the gold fever. After a few ups and downs characteristic of all mining experiences Mr. Landsell struck a rich vein and became a wealthy man. He was liberal with his money in social and personal matters and lavish in his expenditure upon any mining ventures, and in other ways he did much to help the mining industry of the country in its pioneering days.

MARKET AND FINANCIAL NEWS

Decline Rather Than Recovery Foreseen in European Zinc

From the International Metal Service (London)
Correspondent for the American Zinc Institute

THE statistical position of zinc in Europe shows little change, and offers from the Continent are kept within bounds of the present capacity of the market to absorb, so that prices have fluctuated within narrow limits. Taking the opening and closing days of October, we find that the quotation for prompt month's shipment showed no net change, being £26 12s. 6d., whereas the third month's shipment finished up with a loss of 5s. At one time, thanks mainly to a demand for High-Grade and a shortage of supplies which caused a fairly substantial premium to be paid for spot metal, the quotation for G.O.B. jumped to £27 11s. 3d., but there was really nothing to justify this rise, and a few days sufficed to bring the market back to the earlier levels.

Continued lightness of offerings of metal is somewhat of a surprise, but none the less a source of much gratification. Certainly the Belgian output was slightly lower in September; and it is anticipated that the October figure will show a further small cut, but elsewhere there is no sign of any falling away, though after the turn of the year the rationalization of some of the Upper Silesian works may cause some temporary curtailment in output there. Apropos of Upper Silesia, it is officially reported that the results of tests on electrolytic production of zinc are satisfactory and that the resultant metal will compare favorably with any other high-grade zinc. We of course are more concerned with the immediate future, which is entirely dependent on the ability and willingness of holders of stocks to continue to hold off the market. So far there have been one or two rather unexpected bursts of buying to aid the position; for instance, first Russia and then the Central European States have taken up quite good tonnages and so relieved the situation, but a continuance of these rather unusual features can hardly be reckoned on. The salient point seems to be that the demand for zinc sheets is showing definite signs of slackening off, and, as the galvanizing trade is certainly not making up the deficiency, the obvious outcome is rather more metal available for the open market and a corresponding easing of values. Not that we expect anything startling, but the present signs are more in favor of a small decline than of a recovery.

Probably the weakest factor in the outlook right now is the American position, and just what to make of it is puzzling a good many interests over here. Of course, there is no need to worry as to the possibility of any material tonnage of zinc being offered in Europe. Except in abnormal times there can hardly be any great trade in Prime Western, and of late it would appear that producers of High-Grade in America are not finding the European figure attractive, as the agencies here are refraining from offering; but the effect of the continuous sagging in the St. Louis quotation is the reverse of cheerful.

The only bright spot is the demand for High-Grade. True, this has its ups and downs—at the time of writing it is on the up grade again—but, on the whole, it has been quite satisfactory.

The British output for October is computed to have amounted to 4,800 long tons.

World stocks of zinc on Nov. 1 are estimated as follows:

	Metric Tons
United States	32,930
Canada	2,800
Australia (including shipments afloat)	2,500
Germany-Poland	7,200
Belgium	4,100
France	1,500
Great Britain	1,600
Scandinavia	200
Far East	600
Elsewhere	1,500
Total	54,930

TOWAGMAC EXPLORATION COMPANY, LTD., operating in the Rouyn area in northwestern Quebec, has authorized the distribution among the shareholders of 200,000 shares of Aldermac Mines, Ltd., at $2 a share. Towagmac holds 35.2 per cent of Aldermac, and after the resale of the 200,000 shares now offered the company will still own 27.6 per cent. Towagmac has $460,000 cash in the treasury and will receive $400,000 addition from the sale of the 200,000 shares. This money will be invested in good securities to yield about $45,000 yearly, which will be sufficient to continue the exploration activities in which the company has been so successful.

Lower Production Rate Cuts Utah Copper Earnings

THE UTAH COPPER COMPANY reports earnings of $3,804,007 for the third quarter of 1927, compared with $4,031,667 in the preceding quarter, as a consequence of reducing production from an average of 20,018,568 lb. per month to 18,584,261 lb. In spite of the lower rate of output, costs were virtually unchanged. Including depreciation of plant and equipment and all fixed and general expenses, and after crediting gold, silver, and miscellaneous earnings, the per-pound cost was 7.7c., compared to 7.6c. in the preceding quarter. The following figures summarize the results of operations for the two quarters:

	Third Quarter	Second Quarter
Ore milled, tons	3,282,400	3,534,800
Grade of ore, per cent copper	0.97	0.97
Recovery in concentrate, per cent	90.17	90.01
Cost per pound, cents	7.7	7.6
Copper produced, pounds	55,573,703	60,056,091
Net profit from copper production	$2,744,479	$2,896,224
Miscellaneous income, including gold and silver	515,081	591,203
Income from investments	857,631	857,631
Total income	$4,117,192	$4,345,059
Depreciation	313,184	313,391
To surplus	$3,804,007	$4,031,667

STATISTICAL NOTES

PERU'S MINERAL production in 1926 increased 24 per cent in value over that for the preceding year, says the U. S. Department of Commerce. With the exception of vanadium and gold, all the metals mined in Peru experienced a price decline. The value of mineral production amounted to £22,453,627, an increase of £4,392,845 over the figure for 1925. The exchange value of the Peruvian pound was considerably lower in 1926 than in 1925, averages being $4 in 1925 and $3.72 in 1926. Gold experienced an appreciable decline in 1926, production being valued at £496,409, a decrease of £50,117 from that of 1925, the decrease of 15 per cent in weight being even greater. Of the gold, 48 per cent is exported in the copper bars produced at Cerro de Pasco. Production of silver in 1926 amounted to 668,734 kg. valued at £3,587,959. This represents a gain of 23,418 kg. over the record for the previous year and established a new high. Approximately 70 per cent of the 1926 silver exports left the country as contents of copper bars. Production of

copper in 1926 amounted to 42,940 metric tons, a gain of 6,076 tons, or 15 per cent, over that for the preceding year. During the year 8,479 metric tons of lead and 11,927 tons of zinc were produced. The 1926 production of vanadium has been exceeded only once in the country's history. Heretofore Peru has been the world's largest producer of this metal, but, owing to the expanding production of British Africa, Peru has now dropped to second place.

NEVADA CONSOLIDATED COPPER COMPANY, operating in Nevada, Arizona, and New Mexico, reports net income of $1,578,999 for the third quarter of 1927, compared with $1,594,208 for the second quarter, from a production of 52,596,067 lb. of copper, compared with 55,641,299 lb. The cost per pound, including all operating and general charges, except depreciation and reserve for federal taxes, was reduced from 9.25c. to 9.22c. per pound. Comparative financial results are shown in the following:

	Third Quarter	Second Quarter
Operating profit from copper production	$1,574,532	$1,545,115
Value of precious metals	252,041	247,496
Miscellaneous revenues, including income from subsidiaries	165,830	218,500
Total operating income	$1,992,403	$2,011,112
Depreciation	413,403	416,903
Net income	$1,578,999	$1,594,208

BETTY O'NEAL MINES, operating a silver property southeast from Battle Mountain, Nevada, has paid the third 5c. dividend for 1927, amounting to $23,253. Bullion tax reports show production to have been 12,957 tons of ore during the first six months of 1927, averaging $16.43 per ton, with a gross value of $212,932.63, and net proceeds of $78,595.56, or at the rate of $13,000 per month.

NEW JERSEY ZINC COMPANY, for the quarter ended Sept. 30, 1927, reports a surplus of $628,474. The following table summarizes the financial position:

Income, after deductions for expenses, taxes, maintenance, repairs, depreciation, depletion, and contingencies	$1,510,106
Add	
Dividends from subsidiary companies	100,000
Total income	$1,610,106
Deduct	
Dividend Nov. 10, 1927	981,632
Surplus for the quarter	$628,474
Total income	
For the first quarter	$1,769,480
For the second quarter	1,975,514
For the third quarter	1,610,106
For the three quarters	$5,355,100

UTAH-APEX MINING COMPANY for year ended Aug. 31, 1927, shows a profit of $367,202 after depreciation, but before depletion and federal taxes, against a profit of $781,986 in previous year. Current assets as of Aug. 31, 1927, totaled $1,314,986 and current liabilities $170,937.

BROKEN HILL PROPRIETARY COMPANY, LTD., which operates steel works at New Castle, and zinc-lead mines in the Broken Hill district, both in Australia, during the year ended May 31, 1927, netted £291,576 after allowing £318,978 for depreciation. Improved metallurgical results at Broken Hill helped to offset the lower prices realized on lead and silver. Ore totaling 174,338 long tons produced 19,672 tons of lead and 24,673 tons of zinc concentrate.

BROKEN HILL SOUTH, LTD., of Australia, during the year ended June 30, 1927, hoisted 311,673 long tons of ore, having an average assay of 13.4 per cent lead, 10.8 per cent zinc, and 5.1 oz. silver, a material increase over the record of the preceding twelve months. New ore developed during the year equaled in tonnage that mined, so that the reserves still stand at 4,250,000 long tons. Recoveries were as shown in the following table:

Lead, long tons	40,615
Zinc, long tons	33,617
Silver, oz.	1,597,235

Total working costs were 40s. 10.6d. per ton. Gross profit for the year is given as £1,052,474, and net profit to the appropriation account as £438,462.

Cerro de Pasco's Position Good—Costs Low

THE following analysis of the present position of the Cerro de Pasco Copper Corporation is taken from the current issue of the *Boston News Bureau*. It shows the company to be one of the leaders as a low-cost producer, primarily because of the high silver and gold content of the ore.

Cerro de Pasco does not give stockholders operating detail. Its annual report contains no figures of copper, gold, or silver production, prices received, or the cost of "making" its major product, copper. We have obtained, however, the copper output figures and present them herewith, in pounds:

1926	91,794,000
1925	79,998,000
1924	72,018,000
1923	92,176,000

The method of calculating costs varies with different mining companies. Some include taxes and interest as operating items; some include depreciation, but exclude depletion, some take no account of any of these items in the expense account.

Cerro de Pasco's costs are not calculable with absolute accuracy. If from operating expenses we deduct the heavy appropriations which the company makes for depletion of ore and depreciation of plant—in large degree bookkeeping items—and estimate the average price received for copper, it may be figured that the cost is not over 3½ to 4c. a pound. These sensationally low costs are the result, of course, of crediting to the expense account very heavy receipts from silver and other miscellaneous income, including gold and zinc recoveries.

It will surprise readers to know that Cerro de Pasco is the second largest primary producer of silver on either the North American or South American continent, being exceeded only by the United States Smelting Company's Mexican mines, which have a production of 25,000,000 oz. a year. Of course, custom smelting companies like American Metal and the American Smelting & Refining Company, handling custom ores, are the largest units in silver production.

Cerro de Pasco is also a very large factor in gold production. In 1925 its gold output had a valuation of over $1,000,000; that for 1926 was valued at $877,000. Through the courtesy of Comptroller Forster we are able to print herewith the silver and gold output of the Cerro de Pasco company for the past four years, in ounces.

	Silver	Gold
1926	15,145,725	43,864
1925	15,890,299	54,907
1924	13,989,216	38,082
1923	13,736,730	61,047

At 62c. an ounce for silver—the average for 1926 (it is 57c. today) and $20 an ounce for gold, the company's output of these two precious metals last year is given a valuation of $10,260,000—a total of huge proportions and which credited to operating costs proves the contention that viewed solely as a copper project it is the lowest cost producer in the world.

Cerro de Pasco Earning Record

Year	Charges to Depreciation and Depletion	Net Profits	Earnings Per Share After Depreciation and Depletion
1926	$4,804,223	$4,550,837	$4.05
1925	4,321,451	6,016,164	5.36
1924	4,824,215	3,224,327	2.87
1923	6,271,304	2,699,861	2.67

In order to reduce taxable net income, mining companies are permitted to include in their expense accounts sums representing ore exhaustion or depletion, together with liberal amounts to offset depreciation of plant, machinery and equipment. Cerro de Pasco reports the amounts charged for both items. These charges in reality represent concealed earnings.

Perhaps the most impressive development in the finances of Cerro de Pasco is the $9,000,000 increase in net quick assets during the past four years—from $17,468,000 in 1923 to $26,008,000 at the end of 1926. The figures are shown in the following table:

1926	(a)$26,008,356
1925	24,345,224
1924	21,369,676
1923	17,468,296

(a) Of which $17,000,000 is cash and United States Government obligations.

The Market Report

Good Week for Non-Ferrous Metals

New York, Nov. 23, 1927.—Business is well up to the average in volume of sales, and firmer prices are reported for all of the major non-ferrous metals in the week ending today. Copper is up ¼c. to 13.75c. delivered; zinc advanced to 5.85c., an improvement of 15 points; tin made a net gain of about 1c.; and lead is quotably a little higher in St. Louis, with the tone of the market in the East better, even if no change is reflected in quotations. Silver sagged slightly, but recovered; and the minor metals are substantially unchanged.

Copper Advanced to 13.75c.

An excellent business was done in domestic copper on Thursday, Friday and Saturday of last week, with 13.625c. in Connecticut and 13.75c. for the "Middle West" destinations the prevailing prices. By Monday all of the sellers had advanced their price to the basis of 13.75c., Valley. Consumers thus far have shown little interest at this level, but sellers have "stood pat," and the few sales made in the last three days have been at 13.75c. or a little higher, with the exception of one transaction at 13.70c. December and January have been specified in about equal volume, with February represented by a few sales. Wire-drawers have been conspicuous among the buyers. The exporter's price was advanced to 14.05c., c.i.f., on Monday, Nov. 21, at which level a fair business has been done. Sales for export for November have continued to be exceptionally large, the aggregate, it is estimated, being about 60,000 tons thus far in the month. "Standard" copper in London has recorded a rather sharp drop, but speculative transactions had advanced it far out of line, and the reaction has little significance.

Daily Prices of Metals

Nov.	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y	99 Per Cent	Straits	N. Y.	St. L.	St. L.
17	13 40	57 00	57 25	6.20@6.25	6 00	5 70@5.75
18	13 40@13 425	57 50	57.875	6.20@6.25	6.00@6.025	5 75@5.80
19	13.40@13 425	57 75	58.25	6.20@6.25	6.00@6.025	5 75@5.80
21	13 50	58 00	58.50	6.25	6 05	5 85@5.95
22	13 50	57 875	58.25	6.25	6 05	5.85@5.95
23	13 525	57.625	58.125	6.25	6.05@6.075	5 825@5.85
	13 458	57 625	58 042	6.238	6 031	5.819

Average prices for calendar week ending Nov. 19, 1927, are: Copper, 13.338; 99 per cent tin, 57.208; Straits, 57.521; N. Y. lead, 6.238; St. Louis lead, 6.004; zinc, 5.715; and silver, 57.500.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis; i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Nov.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
17	59 9/16	59 11/16	64	262 5/8	257 1/2	20 7/8	21 5/16	26 3/16	25 7/8
18	59 13/16	59 7/8	64	264	259 1/2	20 15/16	21 7/16	26 1/2	26 1/4
21	59 11/16	59 3/4	64 1/2	267	263 1/4	21 1/16	21 9/16	26 5/8	26 3/8
22	59 5/8	59 3/4	64 1/2	267	264	21 3/8	21 3/4	26 5/8	26 5/16
23	58 11/16	58 15/16	64 1/4	264	261 5/8	21 5/16	21 11/16	26 7/16	26 1/8

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Nov.	Sterling Exchange "Checks"	Silver		Gold London	Nov.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
17	4 87 1/8	57 1/2	26 1/2	84s11 1/2d	21	4 87 5/16	57 1/8	26 5/16	84s11 1/2d
18	4 87 1/16	57 3/8	26 1/2	84s11 1/2d	22	4.87 5/16	57 3/4	26 1/2	84s11 1/4d
19	4 87 3/16	56 7/8	26 7/16	.....	23	4 87 3/16	57 3/4	26 11/16	84s11 1/4d
				Avg.			57.396		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths of a cent premium.

Lead in Heavy Demand

Demand for lead has been excellent for the entire week, all producers selling much more than is usual. In the East, the American Smelting & Refining Company has made no change in its contract price of 6.25c., New York, and the greater part of other business has gone at that level, though until the last three days, some round lots were also sold at 6.20c. On Monday, with the sharp advance in London, offerings below 6.25c. disappeared; in fact, there has been some tendency to quote somewhat higher than 6.25c, especially for forward delivery. In the Middle West, sellers found the demand sufficient to justify them in advancing prices above the 6c. level, chemical lead being in somewhat scarcer supply than desilverized.

Practically all classes of consumers have been well represented in sellers' order books except storage-battery manufacturers, though even their position seems improved somewhat over what it has been in recent months. Lead for prompt shipment is not in so much demand as that for December. A good business has also been done for January, a shipment date somewhat further forward than usual. There are still, however, a lot of small consumers who are buying only as they need the metal.

Better Tone to Zinc

A premium of from 5 to 10 points for future zinc over the prices for spot and prompt metal has existed most of the week. This is reflected in a rather wide range of prices, especially on Nov. 21 and 22. Galvanizers, although protesting, as usual, that business is dull, have been prominent buyers in an exceptionally active market. High-grade is quoted nominally, at 7.75c. for spot lots in New York.

Rise in Tin Stimulates Trade

The stronger tone in tin in London has brought both dealers and consumers into the domestic market, good sales being made for both prompt and forward shipment. Spot and forward have sold at approximately the same prices most of the week, and 99 per cent grade has been but little below the price of Straits. Today an active market carried spot Straits to 58⅜c. at the close.

Silver 57¾c.

During the last week the silver market declined, touching 56⅞c. on Nov. 19, which was apparently due to lack of orders from India and sales for China account against purchases of yen. The market has since shown some improvement.

Mexican Dollars (old Mexican pesos): Nov. 17th, 44⅛c.; 18th, 44c.; 19th, 43½c.; 21st, 43¾c.; 22d and 23d, 44⅜c.

Sterling Features Exchange

Continued strength in sterling has been a feature in the foreign exchange market. Closing cable quotations on Tuesday, Nov. 22, were as follows: francs, 3.93¼c.; lire, 5.445c.; and marks, 23.88c. Canadian dollars, 11/64 per cent premium.

Other Metals

Quotations cover large wholesale lots unless otherwise specified. London prices are according to latest mail advices.

ALUMINUM—Per lb., 98 or 99 per cent grade, price of leading interest, 25c.; outside market, 24.30@24.80c.

ANTIMONY—Per lb., duty paid. New York: Chinese brands, spot business, range for the week 10⅜@10¾c. Little difference for forward delivery.

Cookson's "C" grade, spot, 16⅜c. Mexican, R.M.M. brand, 11½c. Needle antimony nominally 8c. for lump and 10c. for powdered. White oxide, Chinese, 99 per cent Sb_2O_3, 15½c.

BISMUTH—Per lb., New York, in ton lots, $1.85@$2.10. London, 8s.

IRIDIUM—Per oz., $110@$115 for 98 @99 per cent sponge and powder. Market dull.

NICKEL—Per lb. ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade) for single lots of spot metal.

PALLADIUM—Per oz., $51@$52. Small lots bring up to $56.

PLATINUM—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $72. Dealers and refiners quote the trade for refined metal, per oz., cash, $64@$65. Market moderately active.

QUICKSILVER—Per 76-lb. flask, range for week $127.50@$128.50, depending on quantity. Market quiet. San Francisco wires $129.17. London, £23; market firm.

RHODIUM—Per oz., $50@$55; London £8@£11½, nominal.

Prices of Cadmium, Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmium, Radium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of Nov. 5.

Metallic Ores

MANGANESE ORE—Per long ton unit of Mn. c.i.f. North Atlantic ports, minimum 47 per cent Mn. 36@38c. Caucasian, washed, 53@55 per cent, 39@40c. Chemical grades unchanged from quotations in the Nov. 5 issue.

TUNGSTEN ORE—Per unit of WO_3, N. Y.; Wolframite, $10.10@$10.25. Western scheelite, $10.35@$10.50. Market dull.

Chrome, Iron, Molybdenum, Tantalum, and Titanium ores are unchanged from quotations in the Nov. 5 issue.

Zinc Ore Higher

Joplin, Mo., Nov. 19, 1927

Blende	Per Ton
High	$42.30
Premium Blende, basis 60 per cent zinc	$37.00@38.00
Prime Western, basis 60 per cent zinc	36.00
Fines and slimes, 60 per cent zinc	33.00@35.00
Average settling price, all zinc	38.14
Galena	
High	$81.90
Basis 80 per cent lead	80.00
Average settling price, all lead	81.09

Shipments for the week: Blende, 11,724; galena, 1,372 tons. Value, all ores the week, $558,330.

Most buyers believed up to noon they were sitting easy on a Prime Western basis of $35, but about that time they learned that one company was busy with an advance of $1 per ton and taking all ore obtainable, reporting, at the close of the market this afternoon, a purchase of 3,100 tons.

Platteville, Wis., Nov. 19, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$37.75
Lead Ore	
Lead, basis 80 per cent lead	$80.00

Shipments for the week: Blende, 980 tons; lead, none. Shipments for the year: Blende, 57,906; lead, 1,565 tons. Shipments for the week to separating plants, 1,845 tons blende.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the Nov. 5 issue.

Mineral Products

ARSENIOUS OXIDE (White Arsenic)—Per lb., 4c. Market slack. London, Cornish white, per long ton, £18¼.

Calcium Molybdate, Copper Sulphate, Sodium Sulphate (Salt Cake), Sodium Nitrate, and Zinc Oxide are unchanged from prices in the Nov. 5 issue.

Ferro-Alloys

FERROMANGANESE—Per long ton, domestic and foreign, 78@82 per cent, $90, f.o.b. furnace. Spot business dull; prices for 1928 not yet established. Spiegeleisen, 19@21 per cent, $30@$31 f.o.b. furnace.

FERROTUNGSTEN—Per lb. of W contained, 75@80 per cent, 92@95c. f.o.b. works. Dull.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrophosphorus, Ferrosilicon, Ferrotitanium, and Ferrovanadium are unchanged from prices in the Nov. 5 issue.

Metal Products

ROLLED COPPER—Sheets, 22½c.; wire, 15½c. per lb., f.o.b. mill.

LEAD SHEETS—Full rolled 9¾c. per lb.; clipped, 10c.

NICKEL SILVER—28⅞c. per lb. for 18 per cent nickel Grade A sheets.

YELLOW (MUNTZ) METAL—Dimension sheets, 19½c. per lb.; rods, 16½c. per lb.

ZINC SHEETS — 10c. per lb., f.o.b. works.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the Nov. 5 issue.

Steel Products Advance

Pittsburgh, Nov. 22, 1927

Steel prices have improved in bars, shapes, and plates, which are now quotable at 1.80c. Pittsburgh and 1.90c. Chicago, an advance of $1 a ton, started by the Carnegie advance announced Nov. 11. Sheets are slightly easier, common black selling freely down to 2.80c. and galvanized down to 3.60c.; strips remain quite irregular.

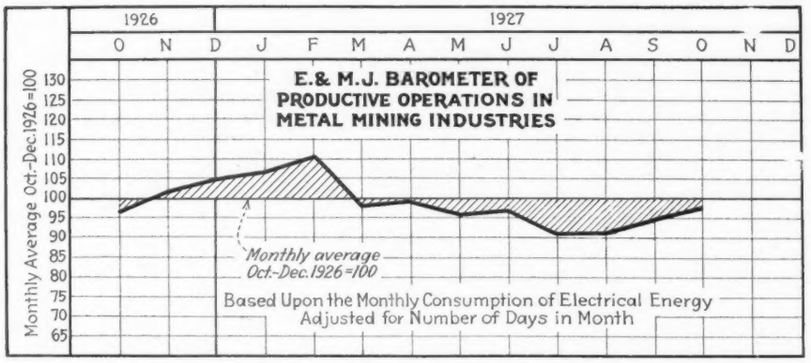
Steel production is at the same rate as shown since July 1. Rail production is increasing, orders booked in the present buying movement now exceeding 1,000,000 tons, with about half as much still under negotiation. Freight-car buying is expected to develop within a few months. Production of steel is practically certain to begin a seasonal increase in January.

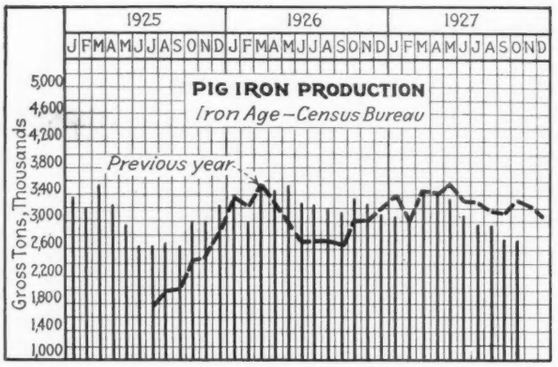
Pig Iron—Prices remain at $18 for bessemer, $17 for basic, and $17.50 for foundry, f.o.b. Valley furnaces, but are largely nominal.

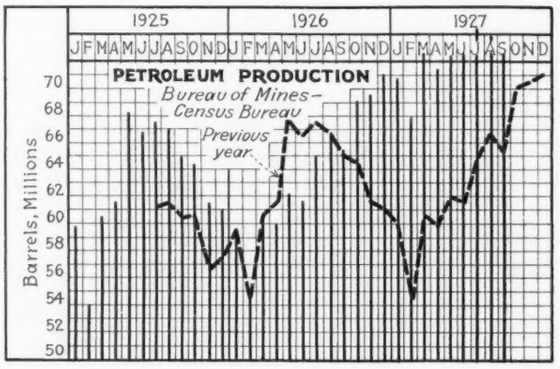
Connellsville Coke—The market remains dull, and heating and furnace grades are slightly lower. Heating, $2.50@$2.65; furnace, $2.75@$2.90; standard foundry, $4@$4.75.

Indicators of Industrial Activity

of Significance to Mining


1926
1927
O N D J F M A M J J A S O N D
E.& M.J. BAROMETER OF PRODUCTIVE OPERATIONS IN METAL MINING INDUSTRIES
Monthly Average Oct.-Dec.1926=100
130 125 120 115 110 105 100 95 90 85 80 75 70 65
Monthly average Oct.-Dec.1926=100
Based Upon the Monthly Consumption of Electrical Energy Adjusted for Number of Days in Month


1925
1926
1927
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
PIG IRON PRODUCTION
Iron Age—Census Bureau
Previous year
Gross Tons, Thousands
5,000 4,600 4,200 3,800 3,400 3,000 2,600 2,200 1,800 1,400 1,000


1925
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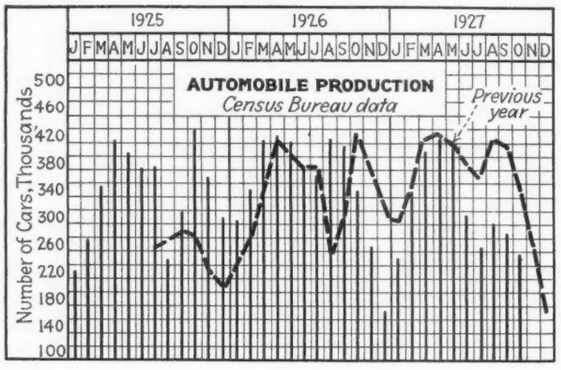
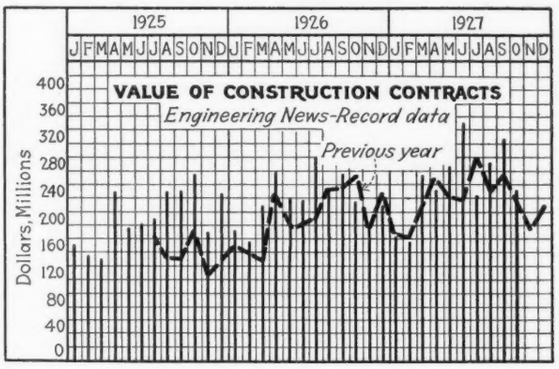
1927
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
PETROLEUM PRODUCTION
Bureau of Mines—Census Bureau
Previous year
Barrels, Millions
70 68 66 64 62 60 58 56 54 52 50


1925
1926
1927
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
AUTOMOBILE PRODUCTION
Census Bureau data
Previous year
Number of Cars, Thousands
500 460 420 380 340 300 260 220 180 140 100


1925
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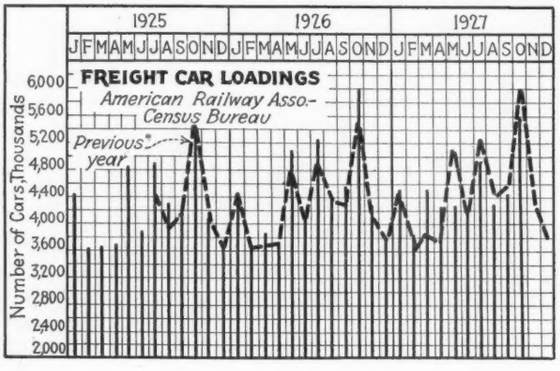
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
VALUE OF CONSTRUCTION CONTRACTS
Engineering News-Record data
Previous year
Dollars, Millions
400 360 320 280 240 200 160 120 80 40 0


1925
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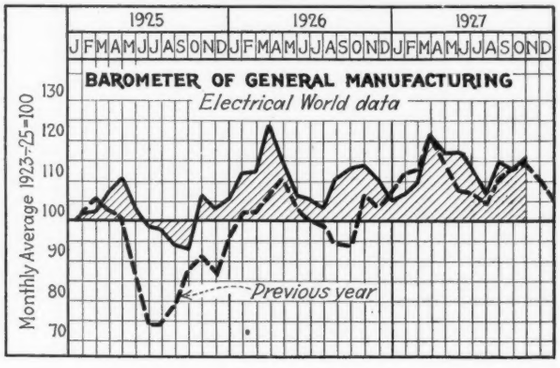
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
FREIGHT CAR LOADINGS
American Railway Asso.-Census Bureau
Previous year
Number of Cars, Thousands
6,000 5,600 5,200 4,800 4,400 4,000 3,600 3,200 2,800 2,400 2,000


1925
1926
1927
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
BAROMETER OF GENERAL MANUFACTURING
Electrical World data
Previous year
Monthly Average 1923-25=100
130 120 110 100 90 80 70

Current Prices of Mining Supplies

Rise and Fall of the Market

STEEL prices gained strength during the last month; principal hot-rolled products are now $1.80 per 100 lb., base, Pittsburgh, against a range of $1.75@$1.80 four weeks ago. Linseed oil is up ¾c. at New York and 4c. per gal. in Chicago. Firmness is noted in hemlock timbers, while pine remains unchanged; fir prices are below October levels. Declines, compared with last month's prices, are reported in galvanized sheets, track bolts, tile, and rope.

SHEETS—Quotations are per 100 lb. in various cities from warehouse, also the base quotations from mill:

	Pittsburgh, Large Mill Lots	St. Louis	Chicago	San Francisco	New York
Galvanized No. 24	$3.65@$3.75	$5.25	$4.80	$5.35	$4.95

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh, Chicago and Birmingham for carload or larger lots:

	Pittsburgh			
	Current	One Year Ago	Birmingham	Chicago
Standard bessemer rails	$43.00	$43.00	$43.00	$43.00
Standard openhearth rails	43.00	43.00	43.00	43.00

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh or carload lots, together with the warehouse prices at the places named:

	Pittsburgh					
	Current	One Year Ago	Chicago	St. Louis	San Francisco	Birmingham
Standard spikes, ⅝-in. and larger	$2.80	$2.80–$2.90	$3.55	$3.65	$3.85	$3.00
Track bolts	3.80	3.90@4.25	4.55	4.60	5.35	3.90
Standard section angle bars, splice bars or fish plates	2.75	2.85@2.95	3.40	3.75	4.25	2.95

STRUCTURAL MATERIAL—Following are base prices per 100 lb. in carload lots, f.o.b. Pittsburgh mill, and Birmingham. At other cities listed, quotations apply on less-than-carload lots, from warehouses.:

	Pittsburgh, Mill	Birmingham	New York	Dallas	St. Louis	Chicago	San Francisco
Beams, 3 to 15 in.	$1.80	$1.90@$2.00	$3.34	$4.00	$3.25	$3.10	$3.00
Channel, 3 to 15 in.	1.80	1.90@ 2.00	3.34	4.00	3.25	3.10	3.00
Angles, 3 to 6 in., ¼ in. thick	1.80	1.90@ 2.00	3.34	4.00	3.25	3.10	3.00
Tees, 3 in. and larger	1.80	1.90@ 2.00	3.34	4.00	3.35	3.10	3.00
Plates ¼-inch thick	1.80	1.90@ 2.00	3.34	4.00	3.25	3.10	3.00

WIRE ROPE—Discounts from list price, f.o.b. New York and east of Missouri River, on regular grades of bright and galvanized are as follows:

Cast steel round strand rope	20%
Galvanized steel rigging and guy rope	7½%
Round strand iron and iron tiller	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%
Galvanized iron rigging and guy rope (*add to list*)	12½%

	New York	Cleveland	Chicago
DRILL ROD (from list)	60%	55%	50%

WROUGHT IRON AND STEEL PIPE—The following discounts from list, are to jobbers for carload lots at Pittsburgh mill:

	Steel			Iron		
	Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD—	⅛ to 3	62	50½	⅛ to 1½	30	13
LAP WELD—	2½ to 6	59	47½	3 to 6	28	13

WROUGHT-STEEL PIPE—From warehouses at the places named the following discounts from list hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
2½ to 6 in., lap welded	48%	51%	46%

CAST-IRON PIPE—The following are prices on class B and heavier, f. o. b. per net ton, for carload lots:

	New York					
	Current	One Year Ago	Birmingham	Chicago	St. Louis	San Francisco
6 in. and over	$40.60	$51.60@ 52.60	$28.00	$36.20	$33.60	$39.00

NUTS—Hot pressed or cold punched, square or hexagonal, blank or tapped, up to 1-in., inclusive, full kegs or cases, discount 55% from new list, April 1, 1927, at warehouses in New York and vicinity.

HOLLOW TILE—Price per block in carload lots, f.o.b., to contractors, for hollow building and partition tile.

	New York						Perth Amboy
	Current on Trucks‡	One Year Ago	Chicago	Philadelphia	St. Louis	San Francisco‡	N. J., Factory
4x12x12	$0.0966	$0.1027	$0.076	$0.105	$0.068	$0.108	.....
6x12x12	.145	.1541	.104	.....	.09	.156	$0.2388*
8x12x12	.1812	.1926	.142	.21	.126	.244	.2956†

* 10x12x12; † 12x12x12. ‡ Partition tile

MACHINE BOLTS—Square heads and nuts, up to 1x30-in., full kegs or cases discount 50% from new list, April 1, 1927 at warehouses in New York and vicinity.

LUMBER—Prices wholesale, per M ft. b.m., in carload lots, f.o.b. San Francisco—At yards, rough Douglas fir, No. 1 common:

	6-8 and 12 Ft.	10-16-18 and 20 Ft.	22 and 24 Ft.	25 to 32 Ft
3x3 and 4	$26.00	$27.00	$28.00	$31.00
3x6 and 8	26.00	27.00	28.00	31.00
4x4-6 and 8	26.00	27.00	28.00	31.00

New York—Prices are for long-leaf yellow pine timbers (rough) to dealers alongside dock. Price to contractors, delivered to job, is $5@$10 additional:

	New York		Chicago	
	20 Ft. and Under	22-24 Ft.	Up to 20 Ft., Pine	Up to 32 Ft., Fir*
3x4 to 8x8	$41.00@42.00	$42.00@43.00	$37.00	$39.50
3x10 to 10x10	48.00@49.00	49.00@50.00	45 00	39.50
3x12 to 12x12	55.00@56.00	56.00@57.00	55.00	39.50

Other Cities—Prices are for rough timbers:

	8 x8-In. x 20 Ft. and Under				12 x 12-In.‡ 20 Ft. and Under	
	Pine	Fir*	Hemlock	Spruce	Pine	Fir*
Boston	$48.00	$47.50†	$49.00	$52.00	$57.50	$57.00
Cincinnati	50.00	.....	.....	.....	65.00	.....
Denver	.....	33 25	34.25	34.25	.....	34.25
Minneapolis	42.50	36.75	34.50	.....	47 00	38.75
Kansas City, Mo.	40 50	39.75	.....	.....	54 50	39.75
Philadelphia	48.00	35.00	40.00	45.00	60.00	35.00

*Douglas fir. †Prime. ‡3x12 to 12x12 Chicago S4S.

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh, Mill	Chicago	San Francisco	Dallas	St. Louis	Montreal
Wire	$2.55	$2.95	$3.25	$4.25	$2.83	$4.95
Cut	2.80	....	4.90	5.00	2.95	5.00

PORTLAND CEMENT—Prices to contractors per bbl. in carload lots *without charge for bags.* Cash discount not deducted.

	Current	One Month Ago	One Year Ago
New York, del. by truck	$2.35	$2.35	$2.50@2.60
Chicago, f.o.b.	2.05	2.05	2.10
Cleveland, f.o.b.	2 24	2.24	2.29

LIME—Warehouse; New York quotes bbl. 280 lb. net; Chicago, 180 lb.:

	Hydrated, per Ton		Lump, per Barrel	
	Finishing	Common	Finishing	Common
New York	$19.45	$12.10	$3.50	$2.35@$2.50
Chicago	20.00	18.00	....	1.50

LINSEED OIL—These prices are per 7½-lb. gallon:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrel (5 bbl. lots)	$0.79½	$0.87	$0.83	$0.85

WHITE AND RED LEAD—In 100-lb. kegs, base price in cents per pound:

	Dry		In Oil	
	Current	1 Yr. Ago	Current	1 Yr. Ago
Red	13.75	15.25	15.25	16.75
White	13.75	15.25	13.75	15.25

HOSE—Quotations at New York warehouses:

Fire Protection 50-Ft. Lengths
Underwriters' 2½-in. coupled, single jacket (net) ..... $0.68 per ft.

Air—Best Grade
¼-in., per ft. 3 ply $0.34 4 ply $0.42

Steam—Discounts from List
First grade 40% Second grade 40-5% Third grade 50%

RUBBER BELTING—List price 6-in., 6 ply, $1.83 per lin.ft. for rubber transmission belting. Discounts from list are as follows:
Best grade 50% Second grade 50-10%

LEATHER BELTING—List price, 24c. per lin.ft., per inch of width, for single ply at New York warehouses:

Grade	Discount from list
Medium	35%
Heavy	30%

PACKING—Prices per pound at New York warehouses:

Rubber and duck for low-pressure steam, ¼ in.	$0.95
Rubber sheet	.50
Rubber sheet, wire insertion	.80

MANILA ROPE—Per lb., ¼-in. and larger, 1,200-ft. coils:

Atlanta	$0.22	New Orleans	$0.20
New York	.26	Seattle	.23
Chicago	.23½	San Francisco	.22½

EXPLOSIVES—Prices per pound for dynamite in small lots:

	Gelatin	
	40%	60%
New York	$0.265	$0.2875
Minneapolis	.1917	.2123
Denver	.2025	.2275
Seattle	.165	.19
Cincinnati	.22	.245
San Francisco	.1625	.1925

FLOTATION OIL—Pine tar, 50 gal. bbl., gross weight 500 lb., f.o.b. New York, carload lots, per gal. $0.35

CHEMICALS—Prices for round lots in New York market, per lb.:

Zinc dust, 550 lb. casks	$0.09@.1
Litharge, casks	.08½
Sodium cyanide, 220 lb. single case lots	.18@.22
Calcium carbide, in drums	.05@.06

Mining Stocks—Week Ended November 19, 1927

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	51	48	50⅜	Oc.15, No.21 Q	0.75
Arcadian Consol.	Boston	2	1⅞	1⅞		
Ariz. Com'l	Boston	5⅛	5⅛	5⅛	Jy. 18, Jy. 30	0.25
Calaveras	N. Y. Curb			1⅞		
Calumet & Arizona	New York	97¼	90½	96¼	Se. 9, Se. 26 Q	1.50
Calumet & Hecla	Boston	18	16½	18	Au. 31, Se.15 Q	0.50
Cerro de Pasco	New York	63⅜	62	63⅜	Oc.13, No.1 Q	1.00
Chile Copper	New York	37⅛	35⅞	37⅛	De. 2, De. 30 Q	0.62½
Con. Coppermines	N. Y. Curb	4⅛	4⅛	4⅛		
Copper Range	Boston	16⅜	14⅞	16⅜	Ap.2, My.2, A	1.00
Crystal Copper	BostonCurb	*30	*27	*30		
East Butte	Boston	2⅛	1⅜	2⅛	Dec., 1919	0.50
Granby Consol.	New York	36¼	35	36⅛	Jn.15 Jy. 1 Q	1.00
Greene Cananea	New York	85	81⅛	83	Nov., 1920	0.50
Howe Sound	New York	39⅜	38⅝	39	Oc.1, Oc.15, Q	1.00
Inspiration Consol.	New York	20⅞	18⅜	20⅞	Ma.17, Ap.4, Q	0.25
Iron Cap	Boston Curb	1⅞	1⅞	1⅞		
Isle Royale	Boston	13⅛	11⅞	13⅛	Se. 30, Oc. 15, Q	0.50
Kennecott	New York	81⅛	79	81⅛	Se.22, Oc. 1, Q	1.25
Magma Copper	New York	51⅞	49⅛	51⅞	Se.30,Oc.15 Q	0.75
Mason Valley	N. Y. Curb	*95	*82	*85		
Miami Copper	New York	16	15⅛	16	No.1, No.15, Q	0.37½
Mohawk	Boston	47	45	47	Oc.31, De. 1 Q	2.00
Mother Lode Coal	New York	2	1⅞	2	Jn.10, Jn.30	0.25
Nevada Consol.	New York	17⅞	16⅛	17⅞	Se. 16, Se. 30 Q	0.37½
New Cornelia	Boston	25⅛	23	25⅛	No.4, No.21 Q	0.50
Noranda	N. Y. Curb	26⅛	25	26⅛		
North Butte	Boston	1⅛	1	1	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*90	*87	*87	Sept. 1926	0.03
Old Dominion	Boston	12⅛	11	12⅛	Dec., 1918	1.00
Phelps Dodge	N. Y. Curb	122½	120	120	De.17, Ja.3 Q	1.50
Quincy	Boston	16	14	16	March, 1920	1.00
Ray Consolidated	New York			15⅜	Ap.20, Ap. 30	0.25
St. Mary's Min. Ld.	Boston	27⅜	26	27⅛	Fe.10, Ma.10	2.00
Seneca Copper	New York	1⅛	1⅛	1⅛		
Shattuck-Denn	Boston Curb	8	7⅞	7⅞		
Tenn. C. & C.	New York	10⅛	9⅛	10⅛	No.30, De.15, Q	0.12½
United Verde Ex.	N. Y. Curb	27⅞	26⅝	27⅛	Oc.6, No.1 Q	0.75
Utah Copper	New York			130	Se. 16, Se. 30 Q	1.50
Utah Metal & T.	Boston	1⅞	*99	1⅜	Dec., 1917	0.30
Walker Mining	Salt Lake	*47	*44	*44		
NICKEL-COPPER						
Internat. Nickel	New York	68⅝	66⅛	67⅜	Se. 16, Se. 30 Q	0.50
Internat. Nickel pfd.	New York	108	108	108	Oc. 13, No. 1 Q	1.50
LEAD						
Gladstone Mtn.	Spokane	*15¼	*14¼	*14¼	June, 1927	0.005
National Lead	New York	127¼	122¾	125	De. 16, De. 31 Q	1.25
National Lead pfd.	New York			112½	Ja.13, Fe. 1 Q	1.50
St. Joseph Lead	New York	37⅜	37	37⅜	De.10,De.20,QX	0.75
ZINC						
Am. Z. L. & S.	New York	6	5⅜	6	May, 1917	1.00
Am. Z. L. & S. pfd.	New York	36¼	35⅛	36¼	No.7, 1920	1.50
Butte C. & Z.	New York	4	3⅜	3⅜	De. 9, De. 24	0.50
Butte & Superior	New York	9	8⅛	9	Se. 16, Se. 30 Q	0.50
Callahan Zn-Ld.	New York	1⅛	1⅛	1⅛	Dec., 1920	0.50
Consol. Lead&Zinc'A'	St. Louis	12	11	12	Ma.15, Ap.1 Q	0.25
Eagle-Picher	Cincinnati	24⅛	24	24⅛	No.15, De.1 Q	0.40
Eagle-Picher pfd.	Cincinnati			117½	Jn.30, Oc.15 Q	1.50
New Jersey Zn.	N. Y. Curb	187	181	186	No. 19, De. 10 X	2.00
United Zinc	N. Y. Curb			*55		
Yellow Pine	Los Angeles	*40	*40	*40	Dec. 1925 Q	0.04
GOLD						
Alaska Juneau	New York	1⅜	1⅜	1⅜		
Argonaut	Toronto	*47	*37	*40½		
Barry-Hollinger	Toronto	1.30	*96	1.30		
Con.W.Dome L.new.	Toronto	*18	*15½	*17		
Cresson Consol. G.	N. Y. Curb	1⅞	1⅜	1⅜	Se. 30, Oc.10 Q	0.10
Dome Mines	New York	12	10½	11⅝	Se.30, Oc.20 Q	0.75
Golden Cycle	Colo.Springs	†1.71	†1.70		Au.30, Se.10 Q	0.04
Hollinger Consol.	Toronto	17.50	17.25	17.50	No. 16, De. 2	0.10
Homestake Mining	New York	71	70½	70½	No.19, No.25 M	0.50
Kirkland Lake	Toronto	3.06	2.75	2.76		
Lake Shore	Toronto	27.75	26.90	27.70	De.1, De.15 ¢Q	0.10
McIntyre-Porcupine	New York	27⅜	27⅛	27⅜	De.1, De.15 Q	0.10
Portland	Colo.Springs	†*30	†*25½		Ap.6, Ap.15, Q	0.02
Rand Mines	New York			48⅛	Au.22-29 Am.Sh.	1.52
Teck-Hughes	Toronto	12.00	10.58	11.90	Jy.21, Au.1	0.10
Tom Reed	Los Angeles	*35	*27½	*27½	Dec., 1926	0.02
Tough-Oakes	Toronto	* 68	*58	*65		
United Eastern	N. Y. Curb			*48	July, 1924	0.05
Vipond Cons.	Toronto	1.05	*75	1.05	Apr.1, Apr.15	0.03
Wright-Hargreaves	Toronto	7.80	6.98	7.50	Oc.17, No.1	0.05
GOLD AND SILVER						
Carnegie Metals	Pittsburgh	12	12	12		
Con. Cortez	N. Y. Curb	*21	*18	*20		
Dolores Esperanza	N. Y. Curb	*42	*40	*40	July, 1923	0.05
Premier Gold	N. Y. Curb	2⅜	2⅛	2⅛	Se. 15, Oc. 4	0.08
Tonopah Belmont	N. Y. Curb	1	1	1	Ma.15, Ap.4	0.08
Tonopah Extension	N. Y. Curb	*16	*16	*16	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	2	2	2	Se.20, Oc 21	0.07½
West End Consol.	N. Y. Curb			*7	Mar., 1923	0.05
Yukon Gold	Boston Curb	*70	*70	*70	June, 1918	0.02
SILVER						
Beaver Consol.	Toronto	2.49	2.20	2.22	May, 1920	0.03
Castle-Trethewey	Toronto	*88	*84	*88		
Coniagas	Toronto	4.60	4.50	4.50	May, 1924	0.12½
Keeley	Toronto	*86½	*81	*82	Se.1, Se.15	0.08
Lorrain Trout Lake	Toronto			*60	July, 1925	0.05
McKinley-Dar.-Sav.	Toronto	*19	*17	*18	Oct., 1920	0.03
Mining Corp. Can.	Toronto	5.00	4.10	4.70	Jn. 29, Jy.15	0.12½
Nipissing	N. Y. Curb	6¾	6¼	6⅜	Se.30, Oc.20 Q	0.07½

Stock	Exch.	High	Low	Last		Last Div.
SILVER-LEAD						
Ahumada	New York	3⅞	3⅜	3⅜	Ma. 25,Ap.4,QX	0.12½
Bingham Mines	Boston	57¼	57	57⅜	Se.24, Oc.5 Q	1.00
BunkerHill&Sullivan	N. Y. Curb	133	130	131½	Oc. 31, No.4	0.75
Cardiff M. & M.	Salt Lake	*82	*61	*64	Feb. 5, 1927	0.10
Chief Consol.	Salt Lake	1.85	1.75	1.80	Nov., 1926 Q	0.10
Consti'nMng.&Mill'g	Spokane	*17	*14½	*15		
Erupcion	Boston Curb	*50	*50	*50	Se. 15, Oc.3 Q	0.07½
Eureka Lily	Salt Lake	1.25	1.10	1.12½		
Federal M. & S.	New York	156	144	144	Jn.25, Jn.29 Spec.	$10
Federal M. & S pfd.	New York	96	95⅜	95½	No. 12 De 15 Q	0.25
Hecla Mining	N. Y. Curb	16⅜	15⅛	16	No.15, De.15 Q	1.75
Highland-Surprise	Spokane	*11½	*11	*11		
Iron King Mining	Salt Lake	*49½	*49	*49½		
Keystone Mining	Salt Lake			*21	Au. 12, Au. 26	0.07½
Lucky Jim	Spokane	*31½	*27½	*27½		
Lucky Tiger-Com	Kansas City	†7 15	†7.00		Oc.10, Oc. 20	0.05
Mammoth Mining	Salt Lake	†1.90	†1.80		Jn.10, Jn.20 Q	0.05
Marsh Mines	Spokane	1⅛	1⅛	1⅛		
North Lily	Salt Lake	3.00	2.75	2.80		
Park Utah	New York	7⅜	7⅛	7⅛	Se. 15, Oc. 1 Q	0.20
Plutus Mining	Salt Lake			1.40	Oc. 25, No. 10 Q	0.10
San Rafael	San Fran.	*9	6½*	9*		
Silver King Coal.	Salt Lake	10.00	9.90	9.90	Se. 20, Oc. 1 Q	0.25
Silversmith	Spokane	*16	*15½	*16	Oct., 1926 Q	0.02
Strattons Mines	Spokane	*49	*45	*48½		
Sunshine M. Co.	Spokane	1.20	1.13	1.13		
Tamarack-Custer	Spokane	*42	*34½	*42	Sept., 1924	0.25
Tintic Standard	Salt Lake	12.12½	12.12½	12.12½	Se.15, Se.29 QX	0.40
Utah-Apex	Boston	4⅛	4⅛	4⅛	Oct., 1926	0.25
IRON						
Bethlehem Steel	New York	56	53½	55	Se. 2, Oc. 1	1.75
Cleveland-Clifis Iron	Cleveland	103	95	102	Oc. 15, Oc. 25 Q	1.00
Colorado Fuel & Iron	New York	78⅜	75½	77	May, 1921	0.75
Gt. North'n Iron Ore	New York	24½	23⅜	23⅜	Dec. 6, Dec. 28	0.75
Inland Steel	New York	53⅜	53	53	No. 15, De. 1 Q	0.62½
Replogle Steel	New York			12⅜		
Republic I. & S.	New York	60	58	60	No. 15, De 1 Q	1.00
Republic I. & S. pfd.	New York	101⅛	99¾	101⅛	De. 14, Ja. 2 Q	1.75
Sloss-Sheffield S. & I.	New York	117	117	117	De. 10, De. 20 Q	1.50
Sloss-Shef. S.&I. pfd.	New York			104½	De. 20, Ja.3 Q	1.75
U. S. Steel	New York	144⅛	138½	144⅛	No. 30, De. 30 Q	1.75
U. S. Steel, pfd.	New York	138	137½	137½	Oc.30, No. 29 Q	1.75
Virginia I. C. & C.	New York	36½	36½	36½	Jan., 1924	1.50
Virginia I.C.&C. pfd.	New York			60½	De. 16, Ja. 3	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN						
De Beers Consol.	New York			27⅛	Jn. 26, Jn.30	1.45
So. Am. G. & P. New.	N. Y. Curb	2⅛	2⅛	2⅛		
Alum. Co. of Amer.	N. Y. Curb	103½	97	103½		
Alum. Co. of Amer.pf.	N. Y. Curb	104½	104²	104½	Se. 15, Oc 1 Q	1.50
Vanadium Corp.	New York	54⅝	51⅜	54⅝	No. 1, No. 15 Q	0.75
Patino M. & E.	New York	20½	19⅜	19⅜	Ap. 27, My. 5	1 sh.
ASBESTOS						
Asbestos Corp.	Montreal	37⅞	36⅜	37	Jan., 1926	1.50
Asbestos Corp. pfd.	Montreal	95	93½	94⅜	Se.30, Oc.15 Q	1.75
SULPHUR						
Freeport, Texas	New York	98⅜	91	97½	Oc.15, No.1 QX	1.50
Texas Gulf	New York	74⅞	71⅛	73⅜	De. 1,De. 15 Q	1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	41	38⅜	41	No.19, De.1 Q	0.75
Amer. Metal, pfd.	New York			110	No.19, De.1 Q	1.75
Amer. Sm. & Ref.	New York	174½	170⅝	173⅜	Oc.14, No. 1 Q	2.00
Amer. Sm. & Ref. pfd.	New York	130⅜	129	130⅜	No., Dec. Q	1.75
Consol. M. & S.	Montreal	250	246	247	Jn 30, Jy.15 X	6.25
Newmont Mining	N. Y. Curb	115⅜	109½	115⅜	Se.30, Oc.15 Q	1.00
U. S. Sm. R. & M.	New York	40	38½	40	Oc. 6, Oc. 15 Q	0.87½
U.S. Sm. R.&M. pfd.	New York	49	48½	48⅜	Oc. 6, Oc. 15 Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED NOV. 8, 1927

Name	High	Low	Last	Date	Amount	Last Div.
Aramayo Mines (25 frs.)	75/7½	75/—	75/—	Nov., 1927	5	p.c. (†)
British Platinum (£1)	—/9	—/6	—/9	Feb., 1925	2½	p.c.
Burma Corpn. (10 rupees)	13/3	12/9	13/1½	Aug., 1927	6	annas*
Bwana M'Kubwa (5s)	4/6	3/10½	4/3			
Camp Bird (2s)	3/4½	3/1½	3/4½			
El Oro (£1)	4/3	4/—	4/3	Nov., 1924	2½	p.c.*
Esperanza (10s)	—/2	—/2	—/2			
Frontino & Bolivia (£1)	14/9	13/1½	14/—	July, 1927	5	p.c.
Mexican Corpn. (£1)	8/6	7/7½	8/6			
Mexico Mines of El Oro (£1)	20/—	15/—	17/6	Dec., 1926	3½	p.c.*
N'Changa Copper Mining	11/6	11/—	11/6			
Oroville Dredging (£1)	7/—	6/4½	6/6	Dec., 1923	3½	p.c.
Ouro Preto (£1)	2/6	2/—	2/3	May, 1925	2½	p.c.
Rhodesian Congo Border (£1)	42/9	40/—	41/3			
St. John del Rey (£1)	10/6	9/7½	10/6	May, 1927	3½	p.c.
San Francisco Mines (10s)	28/6	27/6	28/—	July, 1927	15s.	
Santa Gertrudis (£1)	17/10½	17/—	17/6	July, 1927	7½	p.c
Selukwe (2s. 6d.)	7/—	6/6	6/9	April, 1917	6¼	p.c
S. Amer. Copper (2s.)	2/6	2/—	2/3	Nov., 1917	7½	p.c
Tanganyika (£1)	60/7½	57/6	59/4½	Aug., 1927	7½	p.c.
Union Miniere du Haut-Katanga (Brussels)	10.000	9.675	9.990	July, 1927	182.60	(‡)

* Free of British income tax. † Swiss francs and plus 15 p. c. bonus. ‡ Belgian frs. and free of taxation.

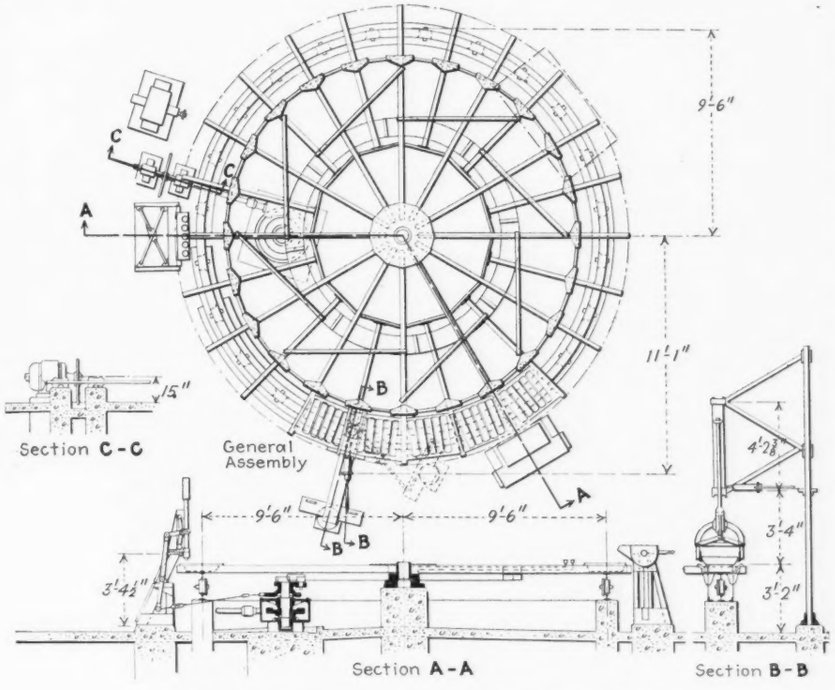
Industrial Progress

A New Machine for Casting Pig Lead

By L. D. Anderson

Chief Engineer, United States Smelting, Refining & Mining Co., Salt Lake City, Utah

ANYONE visiting the various lead smelters and refineries of the country will notice the efforts made to reduce the arduous labor involved in the casting and loading of pig lead. At first thought it would appear to be a simple matter to devise a mechanism which would cast a metal of low melting point, like lead, in a satisfactory manner. Marketing requirements, however, introduce certain complications which have made the problem somewhat difficult of solution. The pigs themselves are generally of about one hundred pounds' weight, tending to make the labor of handling manually several thousand a day rather exhausting, particularly in hot weather. They must be neat in appearance. They must be stacked in the railroad cars in an orderly manner. Efforts to accomplish this mechanically have engaged the thoughts of a number of mechanical men. It may be of interest, therefore, to describe an arrangement which has been operating for some time at the U. S. S. Lead Refinery of the United States Smelting, Refining & Mining Company at Grasselli, Ind.



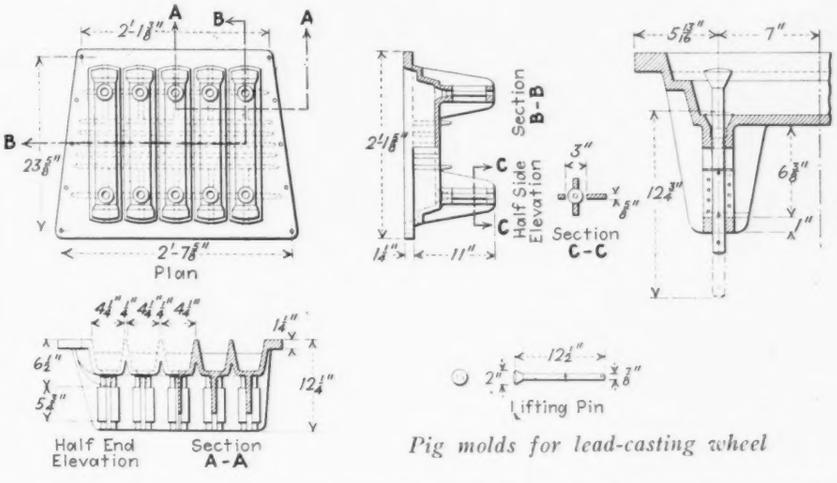
General assembly for 120-pig casting wheel

The design worked out here is a modification of the "wheel" scheme used in several types of casting machines. It comprises 24 molds of five pigs each, arranged in a circle on a structural steel frame, so that the machine if fully loaded would hold 120 pigs. The steel frame rides on rollers maintained between the inner and outer rings of a roller frame. These rollers ride on a circular track.

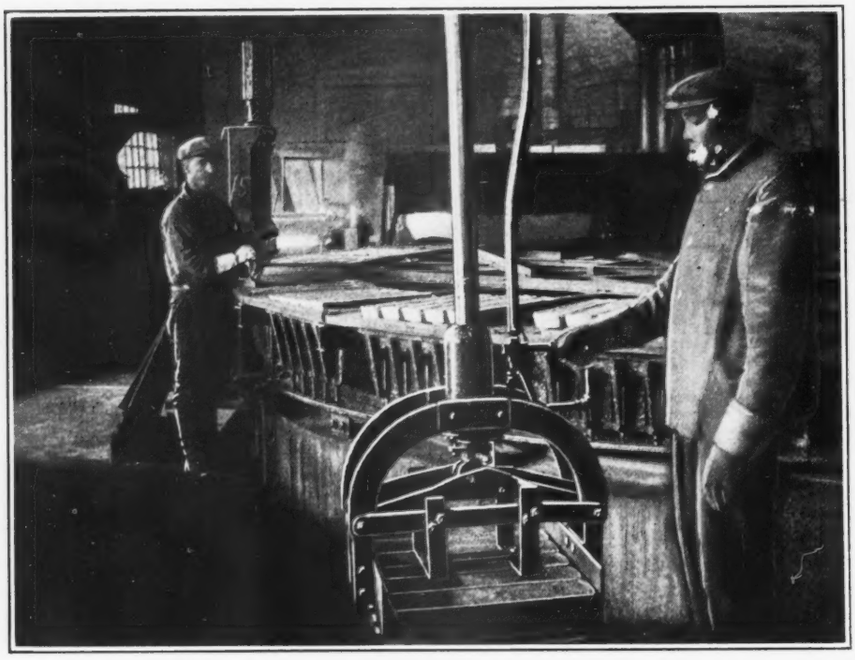
Removal of the pigs from the molds is accomplished through the action of pin ejectors, two for each pig. The lower ends of these pins, at the appropriate times, come into contact with gently rising tracks, forcing the pins to rise in the molds and thereby lift up the pigs. The cut shows the molds in cross-section. Springs were originally considered for forcing the pins back to their seats after riding off the tracks mentioned, but these were found unnecessary, simple gravity being sufficient to cause the pins to drop back into position for pouring.

The motion of the wheel is intermittent, there being a pause to permit the pouring of five pigs in one mold and the removal of five solid pigs from another, followed by a forward motion to the extent of one mold of five pigs, and so on. To accomplish this intermittent motion without jar, so as to avoid shaking partly liquid metal, was something of a problem. Solution lay in a mechanism which might be described as a modification of the Geneva stop. A 5-hp. motor drives, through a roller chain, a worm-and-worm wheel. On the vertical shaft of the worm wheel is a crank arm at whose extremity is a crank pin surrounded by a sleeve or roller bearing. Uniform circular motion of this crank pin is transformed into intermittent circular motion of the wheel by the entrance of the pin into radial slots in a casting on the wheel, from which it emerges at each revolution of the crank pin. There are 24 slots on the wheel, so each revolution of the crank moves it one twenty-fourth of a revolution, equivalent to the spacing of one mold of five pigs. The motion of the wheel might be described as approximating half of a sine wave, starting slowly and gradually increasing to a maximum from which it gradually slows down to zero, followed by a period of rest corresponding to the second half of a sine-wave cycle. During this rest period an arc cast on the crank arm slips into a corresponding arc on the wheel and prevents it from turning until the moment arrives for another movement.

During the rest period of the wheel the pigs are stamped with their lot numbers by the mechanism shown at the left of the general drawing. An eccentric is cast on the lower part of the



Pig molds for lead-casting wheel



Pig-lead casting machine

On the left, behind the man, is the stamping mechanism. The pigs are seen rising out of the molds as they progress in a counter-clockwise motion. In the foreground is the pneumatic clamp for lifting pigs off and stacking them in piles to be handled by an electric truck.

crank already described. By means of a bent eccentric rod, reciprocating motion is imparted to the vertical lever to the lower end of which the rod is attached. To the upper end is attached a slotted link. The movement of this link sets up and then trips a toggle-joint linkage supporting a yoke carrying five plungers, one for each pig of one mold, in whose lower ends are fastened the numbering stamps. When the two levers (one of which turns at its bottom on a pin in the framework, the other on a pin in the yoke, with their opposite ends pinned together) are moved into an approximate straight-line position the yoke rises and lifts the plungers. When the slotted link pulls the middle pin to the left the toggle is tripped, allowing the yoke, and the plungers which it carried, to drop, the slot in the link permitting the middle pin of the toggle to move far enough so that the plungers come into definite contact with the pigs of lead underneath. It will be apparent that by setting the eccentric at the right angle to the crank arm the numbering stamps are permitted to drop on the pigs while at rest and are then lifted up again before the wheel starts.

As the wheel turns intermittently, lead is cast into one mold of five pigs at a time from a pipe supplied by a centrifugal pump immersed in the main melting and drossing kettle. Water is sprayed on the bottom of the molds to keep them cool, and at that point in the revolution where the lead has solidified, water is sprayed on the surface, as well, to cool the pigs further. The resulting vapor is caught under a sheet-iron hood and exhausted to the external atmosphere by a fan (not shown). Following this the stamping machine comes into action. Shortly afterwards the ejector pins come into contact with the rising tracks underneath. Finally, five pigs, cooled, stamped, and raised out of their mold, arrive underneath the lifting crane ready to be removed and set on the floor by the pneumatic cylinder and clamp shown. Swinging of the crane arm is facilitated by a horizontal air cylinder. The crane mast is attached to the building structure by fastenings (not shown). With this arrangement the pigs are stacked in piles of 35, consisting of seven layers of five each, alternate layers being at right angles to adjacent layers. An electric truck straddles the pile, lifts the pigs, transports them to railroad freight cars, and sets them in place, having passed over two platform scales en route.

An attempt was made to pour five pigs simultaneously with the pouring spoon shown. It proved to be difficult to fill all the molds to exactly the same depth, on account of the tendency of dross to clog the spouts slightly so that they would not pour evenly. The multiple pouring spoon was finally abandoned, therefore, and single pouring adopted, with satisfactory results.

The use of this casting wheel has brought a number of advantages, in addition to lightening the labor formerly required. It is possible to keep the premises much cleaner and tidier than formerly, and much less scrap is made in machine casting than in hand casting. As this means less to remelt and dross, the outut of the melting kettle is naturally considerably increased, effecting a real saving in costs. The work as a whole is accomplished in considerably less time than was formerly required and the wheel acts as a pace setter so that the work progresses in a systematic and orderly manner.

When first using this casting apparatus there was naturally some awkwardness caused by unfamiliarity with the scheme. Until this awkwardness had been overcome by practice and some small details of construction smoothed out, results were not as encouraging as had been expected. In general, this seems to be quite common experience when any new device is first tried; it is mentioned particularly here as an encouragement to any who may be wrestling with efforts toward improving present practices in metallurgy. A certain routine becomes established after long years of practice, so that considerable confusion is caused when it is first replaced by a new system. Patience at this time means much toward ultimate success. In this particular case much credit must be given to F. F. Colcord, vice-president; J. J. Mulligan, superintendent; to Mr. Merrick, general foreman; and staff, who jointly conceived the idea and pulled together enthusiastically until it was finally worked out to a satisfactory conclusion.

CATALOGS

CHAIN HOIST — Dickerman Hoist Manufacturing Co., Cleveland, Ohio. Bulletin 21, on spur-geared ball-bearing chain hoists.

DUST COLLECTOR—American Blower Co., Detroit, Mich. Bulletin No. 1124, on "Collecting Fly-Ash and Coal Dust." Pages 12, illustrated.

GAS BOOSTERS—Connellsville Blower Co., Connellsville, Ind. Bulletin No. 33, on Victor industrial gas boosters. Pages 4, illustrated.

FLOTATION—Denver Equipment Co., 1419 Seventeenth St., Denver. Bulletin 2701. Denver Sub-A Fahrenwald flotation machine. Pages 20, illustrated.

FURNACE—Nichols Copper Co., New York, and Pacific Foundry Co., San Francisco, have jointly issued Bulletin 200 covering the Nichols Herreshoff furnace for roasting, calcining and drying: also for the reactivation of fullers' earth, clays, or other filtering media. Pages 32, illustrated.

HEAT INSULATION—Celite Products Company, 1320 South Hope St., Los Angeles, Calif. A reprint of a lecture on "High Temperature Insulation." This lecture includes data on methods of measuring heat flow through walls as well as temperature gradients and heat losses through typical insulated and uninsulated walls. The text is illustrated with drawings. Pages 16.

ROD MILL—The Hardinge Company, York, Pa. A bulletin describing the company's conical ended rod mill. Pages 4; illustrated.